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THE

COCCIDÆ OF CEYLON.

BY

E. ERNEST GREEN, F.E.S.

PART IV.

WITH THIRTY-NINE PLATES.

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CONTENTS OF PART IV.

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CHAPTER VI. (*continued*).

LECANIINÆ (*continued*).

Neolecanium . . *Page* 251
„ crustuliforme . 252
Protopulvinaria . . 253
„ longivalvata . 254
Ceronema 255
„ koebeli . . 256
Pulvinaria . . . 258
„ thespesiæ . . 259
„ tessellata . . 260
„ cellulosa . . 262
„ psidii . . 264
„ ixoræ . . 266
„ tomentosa . 267
Ceroplastes . . . 268
Ceroplastes ceriferus *Page* 270
„ rubens . . 273
„ actiniformis . 275
„ floridensis . . 277
Vinsonia 279
„ stellifera . . 280
Inglisia 282
„ chelonioides . 283
Ceroplastodes . . . 284
„ cajani . . 285
„ chiton . . 287
„ virescens . . 288
Aclerda 289
„ distorta . . 290

CHAPTER VII. ASTEROLECANIINÆ 293

Lecaniodiaspis . . . 297
„ azadirachtæ . 298
„ malaboda . . 300
Anomalococcus . . 302
„ cremastogastri . 303
Cerococcus . . . 305
„ ornatus . . 306
„ albospicatus . 308
„ roseus . . 310
Asterolecanium . . 311
„ exiguum . . 315
„ rubrocomatum . 316
„ tenuissimum . 318
„ udagamæ . . 319
„ aureum . . 320
„ flavociliatum . 322
pudibundum . 323
Asterolecanium—
„ ceriferum . . 324
„ „ *v.* prominens 326
„ coronatum . . 327
„ bambusæ . . 328
„ tumidum . . 330
„ thespesiæ . . 331
„ delicatum . . 332
„ solenophoroides . 334
„ lineare . . 336
„ miliaris . . 338
„ „ *v.* longum 339
Pollinia 340
„ ceylonica . . 341
Amorphococcus . . . 342
„ mesuæ . . 343

COCCIDÆ OF CEYLON.

IN the original prospectus of this work, I estimated that it would be completed in 4 Parts, each containing 30 Plates. But so much additional material has been accumulated during the progress of the work that this has been found to be impracticable. The present (4th) Part contains many additional plates which (with the several supplementary plates) bring the total number up to 135, or 15 plates more than the number promised to my subscribers. For the completion of the monograph it will be necessary to bring out a 5th Part, of double size, containing from 50 to 60 plates. I propose to offer this to my subscribers at the price of 35*s*. Afterwards, the complete monograph will be procurable by the general public at 7 guineas.

E. ERNEST GREEN.

OWING to an unexpected delay in the reproduction of the plates for Part IV. (the text of which was completed and printed in February last), an alteration of one of my names becomes necessary. Dr. L. Lindinger has recently described a new and distinct species of *Asterolecanium*, from Cocoanut palms in Brazil, under the name of *A. lineare*. I had given the same name to one of my new species from Arundinaria (see p. 336 and Plate CXXVIII.). I now propose the name *lanceolatum* in place of *lineare*, which is now preoccupied.

E. ERNEST GREEN.

October 27th, 1909.

SEP 1910

NEOLECANIUM, *Parrott.*

Neolecanium, Parrott, *Can. Ent.*, Vol. XXIII., p. 58 (1901).
Neolecanium, Cockerell, *Ann. Mag. N. H.* (7), Vol. III. p. 451 (1902).

This was originally distinguished as a subgenus by Parrott in 1901, and was given generic rank by Cockerell in 1902. I have not seen the original diagnosis, but Cockerell (*Can. Ent.*, Feb. 1901) describes it briefly in the following terms : 'Adult female covered with a more or less distinct glassy test ; skin crowded with large glands.' The genus has hitherto included only some American species—chiefly from Mexico and Brazil. It is therefore with some hesitation that I have adopted it for an aberrant form from Ceylon which, however, appears to fit the brief diagnosis sufficiently well. The 'more or less distinct glassy test' is represented in our Ceylon insect merely by a very thin varnish-like coating. The dermal cells are very well marked.

NEOLECANIUM CRUSTULIFORME, *sp. nov.*

(PLATE XCIV.)

Adult female (*figs.* 1, 2, 3) oval, sometimes broadly so; moderately convex above; margin greatly thickened and slightly upturned, elevated by a submarginal ventral densely chitinous wall; disc finely, margin coarsely granulate; a short median carina at anterior extremity, and a double carina connecting the anal operculum with the posterior margin. Colour bright castaneous, the disc marked with an irregular black loop; margin dark reddish brown; anal operculum dark castaneous. The structure of the limbs and marginal fringe is obscured—in the older examples—by the very densely chitinous derm, and can be studied satisfactorily only in the early adult insect. Antenna (*fig.* 4) six-jointed, the third longer than the terminal three together; terminal joints much wrinkled. Legs rather slender; tibia scarcely longer than tarsus; foot with four digitules, the unguals small and narrowly dilated. Valves of anal operculum (*fig.* 5) with base and outer edge forming an even curve; moderately pointed at apex. Margin (*fig.* 6) with a close series of stout sharply-pointed spines; a single slightly larger spine marking the stigmatic area; no conspicuous stigmatic cleft. The subsequent incrassation of the margin overlaps and conceals the fringe of spines. Derm crowded with large irregularly oval or pyriform cells (*fig.* 7), each with a smaller and more regularly oval paler inner areola which lies at a lower stratum in the derm; many minute translucent pores piercing the surface; a few larger glandular pores distributed amongst the dermal cells. Length 2·75 to 3 mm. Breadth 1·75 to 2 mm.

Male unknown, in any stage.

On small branches of undetermined tree; Chilaw.

Superficially resembling a *Lecanium*, but differing in the spinous margin and the submarginal ventral wall. The name is suggested by the pie-like contour of the adult insect which is particularly noticeable in the side view (see *fig.* 3).

EXPLANATION OF PLATE XCIV.

NEOLECANIUM CRUSTULIFORME.

Fig. 1. Adult insects, *in situ*, nat. size.
2. Adult female, dorsal view, × 15.
3. " " side view, × 15.
4. Antenna, × 250.
5. Anal operculum, × 250.
6. Marginal fringe and stigmatic area, from below, × 450.
7. Dermal cells, × 250.

PROTOPULVINARIA, *Cockerell.*

Protopulvinaria, Ckll., *Journal Trin. Nat. Club*, Vol. I. p. 300 (1894).

Differs from *Lecanium* in the presence of a narrow fringe of cottony secretion surrounding the female after oviposition. This fringe is not of the same nature as the ovisac of *Pulvinaria*, as it does not actually cover the eggs, which are all concealed beneath the body of the insect. In this respect the genus is midway between *Lecanium* and *Pulvinaria.* Mrs. Fernald, in her *Catalogue of the Coccidæ of the World*, has relegated *Protopulvinaria* to a subgenus of *Pulvinaria* ; but it might, with equal or more justice, be included in the genus *Lecanium.* The discovery of a second species, so manifestly congeneric with Cockerell's *P. pyriformis*, justifies the retention of generic rank for the name *Protopulvinaria.*

PROTOPULVINARIA LONGIVALVATA, *sp. nov.*

PLATE XCV.

Adult female (*figs.* 1, 2, 3) broadly pyriform, more or less acuminate in front. Flat ; obscure fine ridges radiating from centre to margin ; often with an inconspicuous ridge about half-way between centre and margin, and following the outline of the latter. Colour reddish ochreous ; median thoracic area suffused with castaneous ; a broad diffused castaneous marginal zone. Eyes black, submarginal. Anal operculum castaneous ; central ; the anterior extremity at level of insertion of median legs (*fig.* 3) ; remarkably elongated (*fig.* 5), base more than five times length of outer edge ; total length equal to one-fourth of entire insect. Antenna (*fig.* 4) with eight joints ; third and eighth equal and longest ; formula (3, 8), 2, 1, 5, 4, (6, 7), or (3, 8), 2, (1, 5), 4, (6, 7). Legs small; tarsus shorter than tibia. Stigmatic spines 3 (*fig.* 6), in shallow cleft ; the median one more than twice length of others, projecting beyond margin. Marginal hairs (*fig.* 6) very small, terminally fringed. Derm cells oval ; well-defined on the dark marginal zone ; obsolescent on the median area. Ovisac represented externally only by a very narrow fringe of cottony secretion. Length 2·25 to 3·50 mm. Breadth 2·25 to 3 mm.

Male unknown in any stage.

Eggs at first creamy white ; afterwards becoming reddish ; slightly covered with waxy filamentous secretion.

Young larva broadly oval ; reddish.

On leaves of pepper (*Piper nigrum*). Heneratgoda. October. The larvæ and early-adult females affect the upper surface of the leaves ; the mature females usually migrate to the under surface of the leaf for oviposition.

Very closely allied to *Protopulvinaria pyriformis*, Ckll. (syn. *Pulvinaria newsteadi*, Leonardi). It has the same pyriform contour, the same remarkably elongated anal operculum, and a similar dermal pattern. It differs in having eight-jointed antennæ (instead of seven, as in *P. pyriformis*) ; in the slightly greater length of the anal operculum ; and in the considerably smaller marginal hairs. The remarkable form of the valves of the anal operculum distinguishes this from any known species of *Lecanium*. In Ceylon, it is most nearly approached in this respect by *L. mangiferæ*.

EXPLANATION OF PLATE XCV.

PROTOPULVINARIA LONGIVALVATA.

Fig. 1. Leaf of pepper, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 10.
3. „ „ ventral view, × 15.
4. Antenna, × 150.
5. Valves of anal operculum, × 100.
6. Stigmatic spines and marginal hairs, × 650.

CERONEMA, *Maskell.*

Ceronema, Mask., *N.Z. Trans.*, Vol. XXVII. p. 55 (1894).

'Female insects, in the adult stage, covered wholly or partially by tests of threads more or less closely woven, neither glassy, nor cottony, nor felted, never forming homogeneous plates. No fringe. Form of insect Lecaniid, showing cleft and lobes. Male pupa covered by a glassy test of normal Lecaniid form, composed of plates more or less homogeneous.'

The above is Maskell's diagnosis of the genus. The following species, which has been included in the genus provisionally—at the suggestion of Maskell himself—has a partial test of a structure that does not altogether agree with that author's diagnosis, being of a closer and more homogenous nature. But the insect agrees with the characters of this more nearly than with those of any other Lecaniid genus.

CERONEMA KOEBELI, *sp. nov*

(PLATE XCVI.)

Adult female, before gestation (*figs.* 2, 3), of the usual Lecaniid form; oblong oval, convex above, smooth, often with an inconspicuous median carina, rounded in front, pointed behind. Colour olive-brown to reddish-brown above, pale olive-green beneath; dorsum sometimes with delicate waxy polygonal plates; eyes and anal operculum black; a crenulate line of white secretion on each side of dorsum—at some little distance within margin—marking the future position of the waxy ridges (*fig.* 2). After gestation, the body is elevated behind by the accumulation of eggs, which are closed in by a compact waxy fluted, pale ochreous ovisac, overlapping the margins of the body, but leaving the central dorsal area partly exposed. This ovisac bears eight more or less prominent ridges on each side, including a pair of broad ear-like processes at the anterior extremity of the insect (*fig.* 5). The median dorsal area—in fresh examples—is thinly coated with ochreous mealy powder, but becomes denuded in old specimens. On the under surface the stigmatic areas and junctions of abdominal segments are marked by lines of white waxy matter (*fig.* 3). Derm very thick, with large crowded irregularly polygonal thick-walled cells (*fig.* 6), a circular aperture in the inner wall resembling a nucleus; a minute pore in centre of outer wall with a narrow canal penetrating the centre of each cell. Abdomen below with transverse bands of small circular spinnerets corresponding with the waxy bands on the living insect. Eyes distinct, at some distance within margin. Antennæ nine-jointed (*fig.* 10); in some examples the division between third and fourth is incomplete, or may be altogether absent, making the antenna eight-jointed (*fig.* 11); third joint always longest, third, fourth, and fifth (or third and fourth) without any hairs; formula very variable. Foot (*fig.* 7) with four digitules, the unguals broadly dilated, claw strongly hooked at tip; tarsus with indications of three sub-joints, marked by indentations and series of small hairs. Anal operculum (*fig.* 8) broad; base and outer edge forming together an irregular curve. Anogenital ring with eight stout hairs. Margin (*fig.* 9) with stout pointed spines; stigmatic spines numerous, stout, curved, irregularly disposed on dorsal surface along a line directed inwards from the stigmatic cleft. Length of full-grown insect 5 to 7·50 mm. Breadth 3·75 to 6 mm. Length with ovisac, 10 mm. Breadth 8 mm. Height 7 mm.

Females of second stage and early adults closely resemble, in form and colour, *Lecanium longulum*, Dougl.

Young larva very pale reddish, with a pair of long caudal setæ. Antennæ six-jointed (*fig.* 12); a long flagelliform hair on fifth and sixth joints.

Eggs very small, clear white.

Male puparium (*fig.* 13) white, semitranslucent; elongate, with parallel sides; moderately convex; divided into fourteen distinct plates. Length 2·30 mm. Breadth 1 mm.

Adult male (*fig.* 14) deep reddish brown, the notal plates paler; apodema darker, broadly rounded in front, and divided in the middle. Body rather stout; no caudal filaments. Wings hyaline; costal nervure deep red; halteres present, their bristles engaging with a small lobe at base of each wing (*fig.* 16) Head broad (*fig.* 15); eyes minute, lateral; ocelli four, large and conspicuous. Antennæ ten-jointed; fourth longest, others gradually decreasing in length; all joints with short hairs, tenth with three longer knobbed hairs. Genital sheath half length of abdomen. Total length 1·35 mm.

On branches of *Sapium sebiferum;* Kandy; January. Collected by Mr. Albert Koebele, to whom I have much pleasure in dedicating this interesting species.

Though the structure of the ovisac is not quite typical of t e genus *Ceronema*, as defined by Maskell, the general characters conform more with this than with any other known Lecaniid genus. The author of the genus himself, to whom specimens were submitted, considered that the species should be placed under *Ceronema.*

EXPLANATION OF PLATE XCVI.

CERONEMA KOEBELI.

Fig. 1. Branch of *Sapium sebiferum*, with insects, nat. size.
2. Adult female, before gestation, dorsal view, × 6.
3. „ „ ventral view, × 6.
4. „ during formation of ovisac, side view, × 3.
5. „ „ dorsal view, × 4.
6. , dermal cells, × 250.
7 „ foot, × 250
8. „ anal operculum, × 100.
9. „ stigmatic cleft with spines and marginal hairs, × 250.
10. „ antenna (nine-jointed), × 100.
11. „ „ (eight-jointed), × 100.
12. Antenna of young larva.
13. Male puparium, × 13.
14. Adult male, dorsal view, × 20.
15. „ head, from below, × 40.
16. „ base of wing, with one of the halteres, × 40.

PULVINARIA, *Targioni-Tozzetti*

Pulvinaria, Targ., 'Catalogue,' p. 34 (1869).

Adult female resembling *Lecanium* in the early stages and until the commencement of oviposition, when a loose cottony ovisac is secreted from below the posterior extremity of the insect, for the protection of the eggs. The body of the insect is tilted up during the formation of the ovisac, and often becomes much shrivelled and distorted, finally remaining as a small shapeless scale at the anterior extremity of the mass of the ovisac. It is sometimes rendered still more inconspicuous by the partial overlapping of the secretionary matter, but is never completely enveloped. In all purely structural characters there is nothing to distinguish species of this genus from those of *Lecanium*, so much so that, until the period of oviposition, it would be impossible to determine whether an individual should be placed in the one or the other genus. The ovisac may be short and thick, as in *psidii*, or elongated, as in *thespesiæ:* it may be smooth, transversely corrugated, or longitudinally ribbed : there is nearly always a median longitudinal depression, due to the bilateral arrangement of the ceriferous glands.

Male puparium glassy, divided into distinct plates, as in *Lecanium*.

Adult male similar to that of *Lecanium*.

Synopsis of Ceylon Species.

A. Ovisac elongate ; margin of female set with stout spines *thespesiæ*, p. 259.

B. Ovisac comparatively short and stout.

- (*a*) Ovisac longitudinally fluted : dorsum of female tessellated ; anal operculum elongate .... *tessellata*, p. 260.
- (*b*) Ovisac not fluted.
  - (*a*[1]) Living female with pigmented derm cells ... *cellulosa*, p. 262.
  - (*b*[1]) Living female without pigmented cells.
    - (*a*[2]) Marginal hairs of female broadly dilated *psidii*, p. 264.
    - (*b*[2]) Marginal hairs not conspicuously dilated.
      - (*a*[3]) Marginal hairs very long; considerably longer than stigmatic spines .... *ixoræ*, p. 266.
      - (*b*[3]) Marginal hairs pointed ; shorter than stigmatic spines .... *tomentosa*, p. 267.

PULVINARIA THESPESIÆ, *sp. nov.*

(PLATE XCVII.)

Adult female (*fig.* 1) at first pale bright green, dorsum powdered with white mealy secretion; afterwards greenish ochreous, or dull ochreous when dry; derm soft, shrivelling after gestation. Antennæ (*fig.* 2) eight-jointed, of which the third is much the longest (almost equal to the next four together); fifth either equal to or longer than fourth; formula: 3 (5, 4), (2, 8), 1 (6, 7); or 3, 5 (2, 4, 8), 1 (6, 7). Legs (*fig.* 3) stout. Tarsus rather strongly curved; digitules normal. Margin (*fig.* 4) closely set with stout truncate spines, those in stigmatic cleft longer and pointed. Valves of anal operculum (*fig.* 5), with outer angle broadly rounded; apical angle truncate and irregular, inner edge irregularly indented. Derm without conspicuous cells, but with numerous minute circular pores on dorsum, especially towards posterior extremity. Ovisac white, elongate, flattish; finely longitudinally ribbed. Length of insect 6 to 9·50 mm. Breadth 4 to 4·50 mm. Total length, with ovisac, when fully developed, from 15 to 20 mm.

Male puparium (*fig.* 6) creamy white, a small rounded process at centre of dorsum ochreous; opaque, strongly convex. Thick cushions of wax on the median plates, the anterior cushion concave behind. The medial cushion with a rounded process in front, which fits into the concavity of the anterior cushion. Lateral plates with a projecting flange along their upper border. Length 2·50 mm.

Adult male unknown.

On 'Suriya' (*Thespesia populnea*). Jaffna; March.

Closely allied to *P. maxima*, Green (from Java), but rather smaller. Distinguished by the relative proportions of the second and third antennal joints. In *thespesiæ* the second is more than three times the length of the third, while in *maxima* it is rather less than twice the length of the following joint. Differs also in the absence of conspicuous derm cells.

EXPLANATION OF PLATE XCVII.

PULVINARIA THESPESIÆ.

Fig. 1. Leaf of *Thespesia populnea*, with insects, nat. size.
2. Antenna of female, × 100.
3. Anterior leg, × 100.
4. Margin, with stigmatic and marginal spines, × 250.
5. Anal operculum, × 250.
6. Male puparium, × 16.

PULVINARIA TESSELLATA, *Green.*

(Plate XCVIII.)

Pulv. tessellata, Green, 'Catalogue of Coccidæ,' *Ind. Mus. Notes*, Vol. IV. No. 1. p. 8 (1896).

Adult female (*figs.* 1, 2) bright pale green, flattish, slightly concave above after gestation; median area of dorsum distinctly marked with irregular polygonal divisions, which disappear after treatment with potash. Anal operculum (*fig.* 7) very long and narrow, fully one-fifth the total length of the insect; distant from posterior margin by about its own length; base more than four times the length of outer edge; inner edge five times the length of the outer. Anal ring at about middle of operculum. Eyes minute, black, marginal. Antennæ normally eight-jointed (*fig.* 3), but in one example the fourth and fifth joints are confluent and without sign of division (*fig.* 4); formula: (3, 8), 2 (4, 5), 1 (6, 7); or (3, 7), 4, 2 (1, 6), 5; the third and terminal joint always equal and longest. Legs rather slender; digitules normal (*fig.* 6), the unguals spatulate. Tarsus rather more than half length of tibia. Stigmatic spines (*fig.* 5) three, small, the median one more than twice length of the others. Marginal hairs simple, very small. Derm without conspicuous cells, except occasionally on the denser chitinous area, where they may appear as round translucent spots, widely separate. Ovisac white, longitudinally fluted and transversely corrugated. Length of insect 2 to 2·25 mm. Breadth 1·50 to 1·75 mm. Total length, with ovisac, 2·75 to 3·75 mm.

Male puparium (*fig.* 8) oblong oval, glassy, colourless; surface minutely wrinkled and roughened; a slight median ridge bearing five or six small raised points. Scale divided into nine plates, the two median plates with marginal series of minute raised points. Length 2 mm.

Adult male (*fig.* 9) reddish; apodema dark brown. Wings ample, iridescent; costal nervure pale pink. Head (*figs.* 12, 13) flattened in front and behind; pointed above, pubescent. Ocelli four, black. Eyes two, minute, blackish. Sides of head with a dark line marking contour of genæ. Antennæ (*fig.* 10) ten-jointed; terminal joint (*fig.* 11) with three knobbed hairs. Legs very long and slender, hairy. Tarsus less than half length of tibia; foot (*fig.* 14), with fine knobbed digitules. Abdomen terminating in a longish, stout, genital sheath (*fig.* 15), on each side of which is a white thread-like filament, as long as, or longer than, the body of the insect; lateral margin of penultimate segment produced into a long finger-like lobe. Total length, including genital sheath, 1·25 mm.

On under surface of leaves of *Ophiorrhiza pectinata*, Pundaluoya (October). On *Strobilanthes*, Nuwera Eliya, and on undetermined plant, Vatiyantota (November).

The form of the anal operculum sufficiently distinguishes this from other species of *Pulvinaria.* In this character it approaches the genus *Pseudo-pulvinaria.*

EXPLANATION OF PLATE XCVIII.

PULVINARIA TESSELLATA.

Fig. 1. Portion of leaf with insect, nat. size.
2. Adult female and ovisac, × 12.
3. Antenna of female, × 250.
4. „ „ with fourth and fifth joints confluent, × 250.
5. Stigmatic spines and marginal hairs, × 450.
6. Foot of female.
7. Anal operculum, × 250.
8. Male puparium, dorsal view, × 15.
9. Adult male, side view, × 21.
10. Antenna of male.
11. Terminal joint of male antenna.
12. Head of male, side view.
13. „ „ from behind.
14. Foot of male.
15. Abdominal extremity of male, dorsal view.

PULVINARIA CELLULOSA, *sp. nov.*

(Plate XCIX.)

Adult female (*figs.* 1, 2, 4) oblong oval, stigmatic indentations not conspicuously defined. Before gestation moderately convex above, with a more or less well marked median carina (*fig.* 2). Colour pale olivaceous above, the dorsum minutely and closely studded with brown dots, so that—to the naked eye—the insects appear dark brown or even black (*fig.* 1). On microscopical examination, the brown spcts prove to be pigmented dermal cells (*fig.* 3), which are large and crowded, especially on the median area, where they are practically contiguous. The extreme margin is unspotted. Dried examples lose the pigmentation and assume a dull, fulvous tint. Ventral surface olivaceous at margin, the median area bright green. Eyes conspicuous, black, submarginal. After gestation the insect becomes shrivelled and elevated behind, resting on the snowy white ovisac (*fig.* 4). It loses most of the brown spots and appears of a uniform olivaceous or greenish tint. Ovisac with a conspicuous median or longitudinal furrow. Antennæ (*fig.* 6) eight-jointed; the third and fourth approximately equal, longest; seventh shortest; formula: (3, 4), (2, 8), 1, 5, 6, 7. Legs well developed, stout; tarsus more than half length of tibia; foot (*fig.* 7) with stout curved claw, ungual digitules broadly dilated. Margin (*fig.* 5) with what at first sight appear to be simple pointed hairs, but, on closer examination, many of them are seen to be frayed at the extremity (*fig.* 10), but scarcely dilated. As the frayed edge is usually vertical, this character can easily escape observation. Stigmatic cleft shallow, with from four to six stout spines, one of the series being about three times the length of the others. Valves of anal operculum (*fig.* 8) broad, the base rather shorter than the outer edge. Length of insect averaging 3·50 mm. Total length, with ovisac, 4·50 to 5 mm.

Neither adult male nor male puparium observed.

Immature female similar to adult, but smaller; the spots rather more widely separate; usually with a distinct dark median longitudinal stripe.

On *Citrus*. Pundaluoya. March.

After the formation of the ovisac, the insect may be readily mistaken for *P. psidii*; but can be distinguished microscopically by the form of the marginal hairs and by the more conspicuous and crowded dermal cells. Before gestation the insects resemble the early stages of *Lecanium nigrum*.

EXPLANATION OF PLATE XCIX.

PULVINARIA CELLULOSA.

Fig. 1. Young branch of *Citrus*, with insects, nat. size.
2. Adult female, dorsal view, before gestation, × 10.
3. ,, ,, part of scale, showing pigmented dermal cells, × 50.
4. ,, ,, with ovisac, × 8.
5. Stigmatic spines, × 100.
6. Antennæ, × 70.
7. Foot, × 100.
8. Anal operculum, × 100.
9. Dermal cells, × 100.
10. Marginal hairs, × 250.

PULVINARIA PSIDII, *Maskell.*

(PLATE C.)

Pulvinaria psidii, Mask., *N.Z. Trans.*, Vol. XXV. p. 223 (1892).

Adult female (*figs.* 1, 3) at first ovoid ; moderately convex above ; afterwards much shrivelled and contracted ; elevated behind by the mass of eggs and enveloping secretion. Colour green, more or less obscured by a white, powdery secretion ; median area becoming brownish with age, the whole scale turning brown after death. Eyes back, conspicuous during life. Anal operculum dark brown. After gestation, a mass of white cotton-like matter is secreted from the ventral area and pushed out from the margin. The insect then rests on a cottony cushion (*fig.* 3) which projects on all sides, and is eventually recurved over the margin. Ovisac profuse, highly convex, white, cottony, with an inconspicuous median furrow. Derm cells (*fig.* 15) large, approximate, irregularly oval or circular ; usually conspicuous in preparations from fresh material, but often very indistinct and difficult to demonstrate in old, dried material. Antennæ (*fig.* 13) eight-jointed, third joint longest. Usual formula: 3, 2 (4, 5), (1, 8), 6, 7 ; but in some examples the fourth is markedly shorter than the fifth. Legs well developed, tarsus about two-thirds length of tibia ; foot (*fig.* 14) with four digitules, the tarsals stout and dilated at extremity. Margin (*fig.* 12) closely set with stout hairs, which are strongly dilated and dentate at extremity.* Stigmatic cleft with three stout spines, of which the median is much the longest, curved and projecting beyond the margin. Valves of anal operculum (*figs.* 6–11) variable in form and relative proportions of base and outer edge, but the base is usually the shorter. This variation is noticeable even in individuals from the same communities, and is particularly marked in some examples from myrtle, of which no two individuals were identical in this particular. *Figs.* 10 and 11 represent the extremes of this series. Anogenital ring with eight hairs. Length of insect averaging 3 to 3·50 mm., but exceptionally large examples have reached 5 mm. Ovisac measuring 4·50 to 7 mm. in length. Some examples from myrtle, while showing all the structural characters of the type, were exceptionally small, the adult insect measuring only 2 mm. in length with a correspondingly small ovisac.

Immature female (*fig.* 16) more elongate, and with stigmatic indentations more marked. Sometimes mottled with olive brown on discal area. In its earlier stages the insect bears a superficial resemblance to *Lecanium viride*, from which it may be distinguished by the absence of the dark intestinal loop.

Male unknown in Ceylon, though said to occur amongst examples from the Hawaiian Islands and elsewhere.

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* In his original diagnosis of the species, Maskell makes no mention of this character, but describes the margin as set with 'spiny hairs.' But typical examples received direct from his collection have markedly dilated and dentate hairs, and Ceylon examples submitted to the author of the species were accepted by him as *psidii*.

Young larva (*fig.* 2) very pale green. Eggs pale greenish, embedded in the cottony matter of the ovisac.

On leaves, young branches, and fruits of numerous plants, amongst which may be mentioned coffee, tea, cinchona, *Citrus*, *Eugenia*, *Garcinia*, *Duranta*, *Tecoma*, guava, myrtle, *Alpinia*, *Antidesma*, *Ficus*, *Cardamomum*. Frequently massed in such numbers as to hide the green parts of the plant. Abundant throughout the island at all times of the year. Recorded also from New Zealand, Hawaiian Islands, Formosa, China, California, and India.

P. cupaniæ, Ckll., and *P. ficus*, Hempel, are but doubtfully distinct from *psidii*.

The species is kept in check, in Ceylon, by a minute Cecidomyiid fly, which breeds in the ovisacs and destroys the eggs.

EXPLANATION OF PLATE C.

PULVINARIA PSIDII.

Fig. 1. Fruit of *Tecoma stans*, with insects, nat. size.
2. Young larva, greatly enlarged.
3. Adult female, at time of commencement of ovisac, × 7.
4. " " with fully formed ovisac, dorsal view, × 9.
5. " " " " " " lateral view, × 9.
6. Anal operculum, from typical examples *ex* coll. W. M. Maskell, × 100.
7. " " " examples from guava, × 100.
8. " " " " " tea, × 100.
9. " " " " " *Duranta*, × 10.
10, 11. " " " " " myrtle, × 100.
12. Stigmatic cleft, spines, and marginal hairs, × 250.
13. Antenna, × 10.
14. Foot, × 100.
15. Dermal cells, × 250.
16. Immature female, × 10.

PULVINARIA IXORÆ, *sp. nov.*

(PLATE CI. 1–3.)

Adult female ochreous when dry; probably greenish in life; oval; wrinkled. Derm cells absent or inconspicuous. Antennæ (*fig.* 1) eight-jointed; formula: 2, 3, 5, (4, 8), 1, 6, 7. Marginal hairs (*fig.* 2) unusually long, considerably longer than median stigmatic spine; broadest at base, slightly dilated and blunt at extremity. Stigmatic spines three, the median one about twice as long as the others. Valves of anal operculum broad; outer edge slightly longer than base; irregularly rounded and indented at two-thirds from apex. Length 2·50 mm. Breadth 1·60 mm. Ovisac white; similar in form to that of *P. psidii.*

Other stages unknown.

On *Ixora coccinea.* Batticaloa. May.

Described from a single example. The length and form of the marginal hairs readily distinguish this from other Ceylon species.

EXPLANATION OF PLATE CI. 1–3.

PULVINARIA IXORÆ.

Fig. 1. Antenna, × 250.
2. Stigmatic spines and marginal hairs, × 450.
3. Anal operculum, × 250.

PULVINARIA TOMENTOSA, *Green.*

(Plate CI. 4-9.)

Pulvinaria tomentosa, Green, *Ind. Mus. Notes*, Vol. IV. p. 8 (1896).

Adult female (*figs.* 1, 2) olive brown (dried examples ochreous). Dorsum more or less covered with soft woolly secretion in the form of small, tightly curled balls. Ovisac white, gradually and evenly widening to the extremity, with a well-defined median longitudinal furrow. During the formation of the ovisac the anterior part of the scale becomes laterally compressed and recurved by a cushion of secretionary matter, which at this point is thrown into curved radiating folds. Antennæ normally eight-jointed (*fig.* 3), sometimes seven-jointed (*fig.* 4); third longest; formula: 3, 8, 2, (4, 5), (1, 6, 7), or 3, 7, 2, (4, 5, 6), 1. Legs well developed; tarsus rather more than half length of tibia. Claw and digitules normal. Stigmatic cleft rather shallow, with three stout spines (*fig.* 5), the median one about twice the length of the other two. Marginal hairs small; apparently very slightly divided and frayed at extremity, but so minutely as to appear simple and pointed. Derm without conspicuous cells, but studded with minute inconspicuous circular pores. Valves of anal operculum (*fig.* 6) rather narrow and pointed; base slightly shorter than outer edge. Length of insect 2·50 to 4 mm. Ovisac 4 to 6 mm.

Male unknown.

On leaves and small branches of undetermined shrub. Pundaluoya. September.

A scarce species, collected only on a single occasion, and described from three examples.

EXPLANATION OF PLATE CI. 4-9.

Pulvinaria tomentosa.

Fig 4. Insects, nat. size, on leaf and twig of food plant.
5. Adult female, dorsal view, with ovisac, × 9.
6. Antenna, with eight joints, × 100.
7. ,, with seven joints, × 100.
8. Stigmatic cleft, spines, and marginal hairs, × 100.
9. Anal operculum, × 100.

CEROPLASTES, *Gray.*

Ceroplastes, Gray, *Spicilegia Zoologica*, p. 7, pl. III. figs. 6, 7 (1830).
Columnea, Targ., *Studii sul Cocci*, p. 11 (1867).

Adult female usually more or less hemispherical; the body of the insect concealed beneath an inseparable dense waxy covering, which is often demarked into definite plates—especially on the marginal area. The apex of this covering (or 'test') bears a small oblong raised pad of wax, and there is usually a series of waxy points springing from depressed spots corresponding with the centres of the eight marginal plates. The apical pad and the submarginal points are the direct representatives of the early larval test, the parts having become widely separated during the subsequent growth of the insect. The formation of the test can be best understood by a study of the earlier stages. The larval test (see Plate CV. *fig.* 12) consists of a dense median pad (sometimes—as in *actiniformis*—transversely bisected), which covers the greater part of the dorsal area. Surrounding this is a series of fifteen radiating conical processes. The three anterior processes subsequently become incorporated in the cephalic plate. The two following processes on each side become the centres of the two pairs of stigmatic plates. The next two processes are incorporated in the single abdominal plate on each side. The remaining four processes are reduced (by confluence) to two, and form part of the anal plate. These plates—at first more or less distinct and separate—increase in size and become confluent during the growth of the insect. At the same time the dorsal area, which has become tumid and elevated, secretes a more or less uniform covering of wax with the original dorsal pad of the larva as its apical point. In *C. ceriferus* and some other species not represented in Ceylon the waxy covering is exceptionally thickened, and all trace of separate plates is obscured. In the adult insect there are always four well-defined stigmatic bands of pure white wax originating at the stigmatic clefts of the insect, and terminating usually at the depressed spots in the centre of each stigmatic plate. This material is probably porous, and permits the passage of air to the spiracles.

The denuded insect (see Plate CIV. *fig.* 5) greatly resembles one of the hemispherical forms of *Lecanium*. The anal operculum must necessarily open on the surface, and is consequently placed on a densely chitinous process, which varies in prominence according to the thickness of the waxy covering. In its most exaggerated form (in *ceriferus*, Plate CII. *figs.* 3, 4) it appears as a cylindrical extension fully half the length of the actual body of the insect. The antenna—in all Ceylon forms—is composed of six joints, of which the third is very long. Signoret gives this as one of the generic characters, but there are several species—*e.g.*, *cistudiformis*, *egbarum*, and *variegata*—in which both seven and eight antennal joints are present. The typical long third joint is attained through the confluence of three normal joints. The legs are usually well developed, and are present in all known species, but are somewhat

rudimentary in *rubens*. The margin is more or less deeply incised at the stigmatic areas. The stigmatic spines are often very numerous: conical or fusiform, or sometimes hemispherical. The base of the spines is often constricted, but the pedicellate or arrow-shaped form described and figured by Signoret is probably a misinterpretation, this appearance being produced by a subcutaneous duct leading inwards from the spine (see *Ann. & Mag. Nat. Hist.*, Ser. 7, Vol. IV. Sept. 1899, p. 190 and Pl. 30, *fig.* 3*b*). Similar spines are often continued along the margin for some distance on each side of the stigmatic clefts, beyond which their place is taken by the usual marginal hairs. The cephalic lobe is usually more densely chitinous, and pierced below by numerous translucent glandular pores. The valves of the anal operculum are rounded externally. It might be expected that the derm of the dorsum would exhibit specially well-marked glands for the production of the dense waxy covering; but this is not the case. In fact, the dermal pores are remarkably small and inconspicuous, even in such a species as *ceriferus*.

The male, in any stage, is extremely scarce, and has been observed only by Newstead, who describes the male puparium and imago of *C. ceriferus*. The former appears to be of a typical Lecaniid form, but somewhat denser than is usual in the genus *Lecanium*. The adult male (in this single known species) is characterised by a remarkable funnel-shaped organ which terminates the genital armature.

The eggs are numerous and occupy the cavity formed by the contraction of the ventral parts of the body.

The young larvæ are at first indistinguishable from those of *Lecanium*, but early commence to secrete the characteristic waxy covering described above.

It is difficult to understand how any complete ecdysis can occur in such a genus as *Ceroplastes*, in which the body is always enveloped in a closely adherent waxy covering. It is possible that the ventral parts of the exuvia may be extruded from beneath the test; but the dorsal parts are probably incorporated in the waxy covering, though this has not been actually demonstrated. It is certain that the larval waxy processes remain *in situ*, and appear in the fully formed test as the apical pad and submarginal series of points.

The genus has a wide distribution throughout the tropical and subtropical regions of both hemispheres. In Europe it is found only in plant houses, where it owes its presence to the introduction of foreign plants.

Synopsis of Ceylon Species.

A. Anal aperture at the extremity of a long cylindrical process .... *ceriferus*, p. 270.

B. Anal aperture sessile, or on a short conical process.

  (*a*) Dorsal stigmatic bands of test long and narrow *rubens*, p. 273.

  (*b*) Dorsal stigmatic bands of test short and broad.

    (*a*[1]) Height of fully formed test almost equal to breadth .... *actiniformis*, p. 275.

    (*b*[1]) Height of fully formed test approximately half the breadth .... *floridensis*, p. 277.

CEROPLASTES CERIFERUS, *Anderson.*

(PLATE CII.)

Coccus ceriferus, Anderson, *Mon. Cocci ceriferi* (1791).
Ceroplastes chilensis, Gray, *Spicilegia Zoologica*, p. 7 (1830),
Ceroplastes ceriferus, Sign., *Ann. Soc. Fr.* (5), Vol. II. p. 40 (1872).
Ceroplastes australiæ, Walk., *Cat. Brit. Mus., Homopt.*, Vol. IV. p. 1087 (1852).

Waxy test creamy white, with a slight pinkish tinge in very young examples (*fig.* 13); at first conical, the cone gradually bending forward (*fig.* 11) and becoming obscured in older examples when it is represented by an incurved process just above the anterior extremity; very thick and dense, the sides overlapping and concealing the margin. There are usually more or less well-defined tuberosities above the stigmatic areas which are marked by opaque white waxy bands proceeding from the stigmata below, traversing the recurved marginal area and terminating in small depressions immediately above it. Three similar depressions, containing patches of opaque white wax, occur one on the median line in front and one on each side between the posterior stigmatic depression and the anal aperture which is marked by a minute black spot. These depressed areas correspond with pronounced conical tubercles on the sides of the insect itself (see *fig.* 14). The dense waxy test contains a quantity of watery matter which gives it a creamy or greasy consistency noticeable even in examples that have been dead and dried for many years. The wax of the fresh insect is said to have a sweetish taste and to be relished by the natives of India. The body of the insect, as visible on the under surface of the test (*fig.* 2) is dark reddish or purplish brown. After gestation the abdominal area shrinks up, forming an extensive cavity which is filled by a mass of pinkish eggs.

Adult female, after removal of waxy test (*figs.* 3, 4), resembling a brownish globular berry, the long caudal process representing the stalk. This elongate process is rendered necessary by the extraordinary thickness of the waxy test. The body is concave below, strongly convex or globular above, the sides overhanging the margins, which are slightly recurved. There is a submarginal series of conical tubercles—one in front, four on each side (the last two being contiguous), and the long caudal process. These are masked, in the earliest formation of the test (*fig.* 14) by large waxy processes. The caudal process is harder and darker than the rest of the body, obscurely longitudinally striate, and bears at its extremity the anal operculum (*fig.* 7), the valves of which are evenly rounded exteriorly. In the early adult female the body is not so globose, and the conical tubercles are more pronounced (*figs.* 6, 8). Antennæ normally six-jointed (*fig.* 9), the third very long—equal to or longer than the remaining terminal joints together. In some examples the antennæ becomes five-jointed by the fusion of the fourth and fifth (*fig.* 10). There are sometimes indications of a subdivision of the long third joint. Legs comparatively small; claw stout and

curved, ungual digitules broadly dilated, one of them conspicuously larger than the other (*fig.* 15); tarsal digitules also slightly unequal. Stigmatic cleft with numerous (70 to 90) stout hollow conical spines (*fig.* 5) of which the inner four or five are considerably larger than the others. Derm of both dorsal and ventral areas with numerous minute translucent glandular pores, with thickened rims. In some examples a faint tessellate pattern is noticeable on the derm of the dorsal area. Test very variable in size; large, well-developed examples may be 12 mm. long by 10 broad with a depth of 6 mm.; while equally mature examples may be little more than half this size. A large specimen, denuded of wax, measured 8·33 mm. (including caudal process) × 5·20 mm.

Nymphal female (*fig.* 12) without elongate caudal process; flattish, with dorso-lateral series of rounded prominences and a median longitudinal ridge.

Larval test (*fig.* 14) consisting of an elongate median dorsal pad of white wax and a submarginal series of radiating conical waxy processes; the reddish colour of the insect visible in the intervals.

The male insect has been observed only by Newstead, amongst examples received from India. His descriptions are quoted below.

> 'Male reddish brown, body rather short, wide; eyes black, large and prominent; the two ocelli beneath small; antennæ of ten joints, third longest, all with many fine hairs, and deeply notched sides. Legs ordinary. Wings rather short. Genital armature somewhat triangular; with a large, thin, projecting funnel-shaped organ. Anal lobes with one very long hair, and one or more short ones; lobes with numerous circular discs. The long anal setæ in life would no doubt be covered with white wax, forming long white waxy filaments as in all the males belonging to this division of the Coccidæ.'
>
> 'Scale of the male opaque glassy white, with a broad central and three lateral carinæ, the central ones meeting to form a complete loop. Long 2 to 2·50 mm.' (*Ind. Mus. Notes*, Vol. III. No. 5, p. 22.)

On stems and branches of various shrubs and plants: tea; *Antigonon; Pouzolzia walkeriana;* mulberry; *Ficus.* Common throughout the island. March, July, August, October, November, December. The species occurs frequently on the stems of the tea plant, but does no appreciable harm. Recorded also from India, Australia, Japan, Hawaiian Islands, Chili, Mexico, Antigua, and Jamaica.

EXPLANATION OF PLATE CII.

Ceroplastes ceriferus.

Fig. 1. Stem of *Antigonon*, with insects *in situ*, nat. size.
2. Test from below, showing under surface of adult female, nat. size.
3. Adult female, denuded of wax, side view, × 2.
4. „ „ dorsal view, × 2.
5. Portion of spiracular area, showing stigmatic spines, × 450.
6. Early adult female, denuded of wax, dorsal view, × 5.
7. „ „ extremity of caudal process, × 50.
8. „ „ side view, × 12.
9. Antenna of adult female, six-jointed form, × 160.
10. „ „ five-jointed form, × 250.
11. Test of nymphal female, side view, × 10.
12. Nymphal female, denuded of wax, × 15.
13. Test of nymphal female, earlier stage, side view, × 15.
14. Larva, showing early formation of test, dorsal view, × 20.
15. Foot of adult female, × 450.

CEROPLASTES RUBENS, *Maskell.*

(PLATE CIII.)

Ceroplastes rubens, Maskell, *N.Z. Trans.*, Vol. XXV. p. 214 (1892).

Ceroplastes myricæ, Green (*non* Linn.), *Ind. Mus. Notes*, Vol. V. No. 18, p. 8 (1900).

Waxy test of adult female at first deep rose red (*figs.* 1, 2), later of a pale greyish pink tint (*fig.* 5). In the earlier stage (which was taken by Maskell as the type) the apex is somewhat flattened or even depressed. In older examples, the dorsal area is much more convex—sometimes almost globular, and shows no median depressed area. Margin more or less expanded and lobed. The four stigmatic areas are marked by conspicuous narrow contorted bands of opaque white wax, starting from the stigmata below and recurved over the marginal area, and sometimes extended on to the median dorsal area (*fig.* 2). The anterior stigmatic bands are always brought over the front of the test and usually almost meet above the cephalic lobe. Colour of young adult insect (denuded of wax) dark chocolate brown. Older examples become of a paler reddish tint, after deposition of eggs. In parasitised examples the derm of the insect remains of a deep brown colour, and the waxy test is of a deeper red.

Female, denuded of wax (*fig.* 6), of the usual hemispherical form ; cephalic lobe more densely chitinous ; margin rather deeply incised at the stigmatic areas. Anal process prominent, broadly conical, densely chitinous and deeply coloured. Antennæ (*fig.* 10) six-jointed, third very long, equal to terminal three together ; the others short and subequal. Legs (*fig.* 8) very small ; the tibia and tarsus fused together, the line of division indefinite. Foot (*fig.* 9) with minute stout curved claw ; the ungual digitules only very slightly dilated. Stigmatic cleft (*fig.* 7) with a single longish stout conical spine in the centre, and many short, stout, rounded (hemispherical) spines which—in optical perspective—appear as thick chitinous rings or discs. Marginal hairs small and inconspicuous. Derm with numerous minute circular pores. Valves of anal operculum comparatively narrow and pointed. Length of fully matured test 3·50 to 4·50 mm. Breadth 3 to 3·80 mm. Length of denuded insect 3 to 3·50 mm.

Eggs and young larvæ purplish red.

On leaves of tea, avocado pear, mango, cinnamon, *Cycas revoluta*, *Garcinia spicata*, *Calophyllum tomentosum*, *Psychotria* sp., *Eugenia* sp., and various palms. Pundaluoya, Peradeniya, Kandy, Watawella, Heneratgoda, Batticaloa. March, May, June, October, December. Recorded also from Australia, Hawaiian Islands, and Japan.

Readily distinguishable from any other Ceylonese species by the distinct red or pink colour, and by the form and position of the white stigmatic bands.

The species from India, identified and described by me as *C. myricæ*, Linn.

(*Ind. Mus. Notes*, Vol. V. No. 1), is undoubtedly conspecific with our Ceylon insect and with *C. rubens* of Maskell. It may or may not be identical with *myricæ* (Linn.), but the only available descriptions of that species are too vague for any accurate determination.

EXPLANATION OF PLATE CIII.

Ceroplastes rubens.

Fig. 1. Tea leaf, with insects, nat. size.
2. Female, young adult, dorsal view, × 8.
3. " " ventral view, × 8.
4. " " side view, denuded of wax, × 8.
5. " old adult, dorsal view, × 8.
6. " " denuded of wax, side view, × 15.
7. Stigmatic area and stigmatic spines, × 250.
8. Leg, × 250.
9. Foot, × 450.
10. Antenna, × 250.

CEROPLASTES ACTINIFORMIS, *Green.*

(PLATE CIV.)

Ceroplastes actiniformis, Green, *Ind. Mus. Notes*, Vol. IV. p. 8 (1896.)

Adult female (*figs.* 2, 3, 4) with a thick, broadly oval, hemispherical waxy test; the central area domed; the marginal area thickened by a series of eight tumescent quadrate plaques each with a depressed centre and separated by marginal indentations; the apex of the dorsal area with a small depressed oval spot containing a medium elongate raised pad of opaque white wax. Colour very pale pink, deepening to red at the junction of the marginal area, and with numerous fine radiating pinkish streaks; the depressed median spot darker than the surrounding area; the depressed spots on the marginal area, each with one or more small opaque white points, and a fan-shaped band of opaque white wax covering the four stigmatic areas. In dried examples the test assumes a uniform brownish tint. The insect itself, as seen from below (*fig.* 3), reddish brown.

Female denuded of wax (*fig.* 5) smoothly globular, the margin slightly recurved, more particularly at the cephalic extremity, which is denser and more deeply coloured; sides slightly overlapping the margin and indented at two points on each side. Anal aperture on a stout conical process of a deep brown colour. Antennæ (*fig.* 6) six-jointed; the third very long, the fourth and fifth shortest; the subapical hair on second and third joints unusually long. Legs well developed; foot (*fig.* 9) with equal digitules, the unguals broadly dilated. Margin with small pointed hairs, which give place—at the stigmatic areas—to stout conical spines (*figs.* 7, 8). Derm of dorsum with numerous minute translucent pores, which are more crowded on the marginal zone. Size very variable, some specimens, though fully mature (as shown by the presence of eggs beneath the scale), being little more than half the size of others. Length, with waxy test, 2·50 to 4·50 mm. Breadth 2 to 3·75 mm. Height 1·25 to 2·50 mm.

Immature female (*fig.* 11) with the median dorsal area flatter; the marginal plates very distinct and sharply defined.

Male unknown in any stage.

Newly-hatched larva (*fig.* 12) of usual Lecaniid form; pale reddish. After taking up its position on the leaf it quickly commences to secrete a waxy covering which, by the tenth day, has taken the form shown at *fig.* 13, consisting of two median dorsal prominent truncated pads and a submarginal series of fifteen broad, bluntly pointed radiating processes. The anterior waxy pad on the dorsum is pierced by four circular canals, and the posterior pad by several transversely elongate apertures.

Eggs pink.

On the fronds of cocoanut and other palms; on leaves of *Canna* and *Sapium sebiferum*. Pundaluoya, Kandy, Colombo.

A very ornamental species, somewhat resembling *cirrhipediformis* in the form of the waxy test, but differing in the more evenly rounded median dorsal region.

EXPLANATION OF PLATE CIV.

Ceroplastes actiniformis.

Fig. 1. Section of palm frond, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 6.
3. ,, ventral view, × 6.
4. ,, side view, × 6.
5. ,, denuded of wax, side view, × 15.
6. Antenna of adult female, × 250.
7. Stigmatic area, showing stigmatic spines, × 250.
8. A single stigmatic spine, × 500.
9. Foot, × 450.
10. Valves of anal operculum, × 250.
11. Immature female, dorsal view, × 12.
12. Newly hatched larva, × 65.
13. Larva, at tenth day, × 50.

CEROPLASTES FLORIDENSIS, *Comstock.*

(PLATE CV.)

Ceroplastes floridensis, Comst., *Rep. U.S. Dep. Agric.*, 1880, p. 331 (1881).
Ceroplastes rusci, Ashmead (*non* Linn.), *Can. Ent*, Vol. XII. p. 252 (1880).

Adult female (*figs.* 3 to 6) broadly ellipsoidal in outline, strongly convex; with a dense covering of opaque wax, which is greatly thickened and recurved on the margins. The waxy test is usually subdivided by shallow depressed lines which are also continued over the thickened margin; but in many old examples the dorsal area may be quite smooth and homogeneous. In living examples the dorsal area of the test has a pinkish tinge, the marginal area being creamy white. After death the pink tinge disappears and the waxy covering is at first uniform yellowish, later becoming translucent and assuming the reddish-brown colour of the underlying insect. The usual opaque white stigmatic bands are broad and conspicuous, and there is a series of eight depressed spots on the margin, giving rise to small opaque white points. These and the apical waxy pad frequently become blackish (through a growth of fungus) in old samples, and the apical pad is occasionally eccentric (*figs.* 3, 4). In living examples the test has much the appearance of a minute 'cowry' shell (*Cypræa*). Length of mature test varying from 2·75 to 3·75 mm.

Insect denuded of wax (*figs.* 7, 13) dark purplish brown in life, but—after treatment with potash—almost colourless in immature examples and brownish in adult specimens. The anal process always brownish, only moderately prominent. Body evenly rounded above (*fig.* 13), the margin indented at the stigmatic areas. Antennæ (*fig.* 10) six-jointed: the third very long, almost equal to the second and three terminal joints together. Legs well developed; the ungual digitules of foot broadly spatulate (*fig.* 15). Margin with a fringe of minute curved hairs which give place to small conical or fusiform spines at the stigmatic areas (*fig.* 7). Stigmatic spines considerably larger (*fig.* 8) and often bifid or trifid (*fig.* 9). Valves of anal operculum (*fig.* 14) with base and outer edge forming an even curve; apex pointed. Length 2·50 to 3·25 mm.

Male unknown.

Nymphal test (*fig.* 11) composed of pinkish white wax, the centre occupied by the raised opaque white larval pad; a submarginal series of thirteen stout pointed opaque white waxy processes.

Larval test (*fig.* 12) consisting of the dorsal pad and fifteen pointed radiating processes, between which the reddish colour of the insect is discernible.

Newly hatched larva and eggs pale purplish.

On tea, guava, and numerous shrubs and plants. Widely distributed throughout the island.

Recorded also from the United States, West Indies, Hawaiian Islands, India, Brazil, Japan, Australia, and Java.

EXPLANATION OF PLATE CV.

Ceroplastes floridensis.

Fig. 1. Leaf of avocado pear, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 10.
3. ,, with eccentric apex, × 10.
4. ,, from behind, × 10.
5. ,, ventral view, after deposition of eggs, × 10.
6. ,, before deposition of eggs, × 10.
7. Early adult female, after treatment with caustic potash, × 30.
8. Stigmatic cleft, with stigmatic and marginal spines, × 450.
9. ,, with bifid stigmatic spines, × 450.
10. Antenna, × 250.
11. Female of second (nymphal) stage, × 15.
12. ,, larval stage, × 15.
13. Adult female, denuded of wax, lateral view, × 15.
14. Anal operculum, × 250.
15. Foot, × 450.

VINSONIA, *Signoret.*

Vinsonia, Sign., *Ann. Soc. Ent. Fr.* (5), Vol. II. p. 33 (1872).

A monospecific genus. Distinguished from *Ceroplastes* (to which it is closely allied) by the extension of the waxy test into prominent marginal rays. Newstead gives the articulation of the cephalic lobe as a generic character; but this condition is approached in some species of *Ceroplastes*, notably *C. rubens*—in old examples of which the cephalic lobe is sharply demarked from the remaining parts.

VINSONIA STELLIFERA, *Westwood.*

(Plate CVI.)

Coccus stellifera, Westwood, *Proc. Ent. Soc. Lond.*, pp. 3, 111 (1871).
Vinsonia pulchella, Signoret, *Ann. Soc. Ent. Fr.*, (5), Vol. II. p. 34 (1872).
Coccus stellifer, Signoret, *Ann. Soc. Ent. Fr.*, Vol. VI. p. 608 (1876).
Vinsonia stellifera, Douglas, *Ent. Mo. Mag.*, Vol. XXV. p. 152 (1888).

Adult female (*figs.* 1, 6, 7) with a semitranslucent waxy test, the margins of which are flattened and produced into seven rays that give the insect the appearance of a miniature starfish. Median area strongly convex above, the apex with an oblong pad of opaque white wax. Colour of living examples pink (*fig.* 6), darkening with age to purplish red. In dried examples this tint fades to reddish brown. Anal operculum dark brown. Margin colourless during life; yellowish in dried examples. Each ray is tipped by a longish conical process of opaque white wax. The median anterior ray carries a supplementary white point on each side of the terminal process. The following two rays on each side have a well-defined median ridge. A pair of small white waxy processes project from the posterior margin immediately behind the anal aperture. Under surface flat (*fig.* 7). After oviposition, the median area shrinks and forms a cavity for the reception of the eggs. From below, it can be seen that the median anterior ray corresponds with the cephalic lobe. The following two rays on each side are associated with the two pairs of stigmata, while the two remaining rays proceed from the abdominal lobes. At the extremity of each ray, below the base of the terminal process, is a fringe of minute glassy points—the remains of the earliest larval fringe. Diameter—across the median rays—3·50 to 4·50 mm.

Female insect, denuded of its waxy covering (*figs.* 8, 9, 10), irregularly circular; margin sinuous, the position of the rays indicated by rounded prominent processes. Cephalic lobe thin and flattened; extended in front. The rest of the body highly convex and tumescent. The dorsum with four curved longitudinal series of irregular foveæ (*fig.* 9). Anal operculum on a prominent process inclined upwards and projecting beyond the posterior margin. The whole dorsum—in fully matured examples—strongly chitinised. From below the cephalic lobe is sharply demarked by the abrupt border of a more densely chitinous area. A narrow, well-defined area immediately behind it is of a much thinner texture and is studded with irregular oval areoles. The cephalic lobe itself bears many translucent spots. Antennæ placed on the posterior border of the thinner area that follows the cephalic lobe (*fig.* 11); six-jointed, the third nearly equal to the terminal three together (*fig.* 12). There is a conspicuous line of long, stout hairs extending between the bases of the antennæ (*figs.* 11, 12). Legs rather small; tibio-tarsal articulation incomplete; tarsus very short, especially on anterior limbs (*fig.* 13). Foot with four digitules, the unguals

moderately dilated. Stigmatic cleft (*fig.* 14) with a group of stout, somewhat fusiform spines, of which two or three are considerably longer than the others. Marginal hairs small, simple, widely separate. Dormal pores minute and inconspicuous. Valves of anal operculum (*fig.* 15) elongate; base about one-third length of inner edge. Length 1·50 to 1·75 mm. Breadth 1·25 to 1·50 mm.

Adult male observed by Newstead, whose description shows it to be of typical Lecaniid form.

The male puparium is described by the same author as 'formed of the same glassy, cereous matter as the test of the female, and like it also as having an anterior and three lateral rays or arms; but there are two additional short posterior rays, each furnished at the extremity with three snow-white appendages. Outline much more elongate. Length 1·75 to 2 mm.'

Nymphal test of female (*figs.* 4, 5) similar in form to that of adult, but smaller and flatter; the median dorsal pad and the terminal processes of the rays proportionately larger (these parts remaining actually of the same size throughout the development of the test). Insect pale green.

Larval test (*figs.* 2, 3) exhibiting nine opaque white waxy rays, the posterior being smaller and more slender. There are besides a pair of small, rounded, waxy processes on the extreme posterior margin, and a small waxy point on each side of the anterior ray. Dorsum covered by an opaque white pad of wax. All the processes of this larval covering persist throughout the subsequent development, and appear in the fully formed test of the adult female as the terminal processes of the rays and the apical boss of the dorsum.

Habitat (in Ceylon), on leaves of mango, cocoanut, *Garcinia spicata*, *Antidesma bunius*, *Alstonia scholaris*, *Glycomis pentaphylla*, and probably upon numerous other plants.

Widely distributed throughout the tropical regions, and occurring in Europe in plant-houses.

EXPLANATION OF PLATE CVI.

Vinsonia stellifera.

Fig. 1. Mango leaf, with insects *in situ*, nat. size.
2. Larva, ventral view, × 25.
3. " dorsal view, × 25.
4. Nymphal female, ventral view, × 20.
5. " dorsal view, × 20.
6. Adult female, dorsal view, × 15.
7. " ventral view, × 15.
8. Early adult female, denuded of wax, dorsal view, × 15.
9. Older female, denuded of wax, dorsal view, × 15.
10. " " " side view, × 15.
11. Cephalic lobe, from below, × 70.
12. Antenna, × 250.
13. Anterior leg, × 250.
14. Stigmatic cleft and spines, from below, × 450.
15. Valves of anal operculum, × 250.

INGLISIA, *Maskell.*

Inglisia, Maskell, *N.Z. Trans.*, Vol. XI. p. 213 (1878).

Maskell describes his genus in the following terms :—'Test of female glassy, elevated, striated with rows of air cells. Fringe not always present in the adult stage.'

Cockerell's definition is :—'Scale divided into plates, and striated with rows of air cells.'

The above definitions sufficiently describe the character of the test of the insect. The division into distinct plates is a very constant character.

The adult female has the distinctive characters of the *Lecaniinæ*. There is a distinct abdominal cleft, and the usual hinged anal operculum. There is usually a marginal fringe of lanceolate or conical spines.

The genus is principally confined to New Zealand, but isolated species have been recorded from Mexico, Trinidad, India, and now from Ceylon. *Onychocephalus*, of Newstead, appears to me to be very doubtfully separable from *Inglisia.*

INGLISIA CHELONIOIDES, *sp. nov.*

(PLATE CVII.)

Test of adult female (*fig.* 2) glassy ; colourless ; delicately and closely striated horizontally, and partially so perpendicularly ; the marginal plates with concentric striæ. The whole test strongly laterally compressed. Dorsum covered medially by a large conical plate ; a similar but smaller posterior plate, followed by a divided anal plate ; a large inverted boat-shaped plate above the cephalic extremity ; a marginal series of eight small quadrangular plates on each side. Length 8 mm. Breadth, at base, 2·50 mm. Height 4·50 mm.

Body of insect (as seen through the glassy test) castaneous. Dorsum produced into a sharp median point, with divergent paired unciform dorsal processes at the junctions of the three large dorsal plates. There is also a prominent point corresponding with the centre of the posterior dorsal plate. In the diagram (*fig.* 3) the area occupied by the body of the insect is shaded.

With only a single example of this remarkable little insect, I am unwilling to destroy its form by dissection, and am consequently unable to describe the limbs and dermal characters.

Newly hatched larva (*fig.* 4) elongate, narrow ; posterior extremity with two long setæ from the anal lobes and a longish marginal hair on each side. Stigmatic clefts each with a conspicuous pair of flabelliform hairs (*fig.* 5).

A single example, found on a small twig of *Gelonium lanceolatum.* Pundaluoya. July. Several larvæ emerged and were transplanted on to the bush, but failed to establish themselves. I am inclined to think that *Gelonium* is not the normal food plant of the insect. In form and colour it bears a remarkable resemblance to a rose thorn, and it is possible that its proper habitat may be a thorny plant. Under a lens the texture and colour of the test resembles tortoiseshell, and the arrangement of the plates is also suggestive of the carapace of a tortoise or turtle.

EXPLANATION OF PLATE CVII.

INGLISIA CHELONIOIDES.

Fig. 1. Adult female, *in situ*, × 1·25.
2. Test of female, side view, × 10.
3. Diagram, showing area occupied by the body of the insect, × 10.
4. Newly hatched larva, dorsal view, × 100.
5. „ „ „ stigmatic area, × 500.

CEROPLASTODES, *Ckll.*

Ceroplastodes, Cockerell, *The Entom.*, Vol. XXVI. p. 350 (1893).

Adult female, with glassy sac (or test) free from the body of the insect. Test either rugose, or with irregular waxy granules, or bearing symmetrical polygonal waxy plates.

During gestation, the insect shrinks into the anterior portion of the test, the residual cavity then becoming packed with ova. After oviposition, the abdominal segments are turned up till their ventral surface assumes a position approximately at right angles with the under surface of the thorax. Legs and antennæ normal and well developed. Stigmatic clefts well defined; each cleft with a single very long pointed stigmatic spine. Margin of body with a fringe of stout conical spines, usually in two or more rows. Other characters as in *Lecanium*.

This genus differs from both *Inglisia* and *Ctenochiten* in the body of the insect lying freely within the test and contracting (after oviposition) to one end, the hinder cavity forming a receptacle for the numerous ova.

Occurs throughout the Indian region, in Central America, and in Australia.

Synopsis of Species.

A. Test colourless, with numerous irregular granular projections. Marginal spines of female 2-deep .... *cajani*, p. 285.

B. Test colourless, with symmetrical series of prominent polygonal plates. Marginal spines of female 2-deep *chiton*, p. 287.

C. Test greenish, with numerous small glassy spicules, more or less interspersed with short hair-like filaments. Marginal spines of female 3- or 4-deep .... *virescens*, p. 288.

CEROPLASTODES CAJANI, *Mask.*

(Plate CVIII.)

Eriochiton cajani, Maskell, *Ind. Mus. Notes*, Vol. II. p. 61 (1891).
„ „ „ *Trans. N.Z. Inst.*, Vol. XXIV. p. 24 (1891).
„ „ „ „ „ Vol. XXIX. p. 314 (1897).
Ceroplastodes cajani, Cockerell, *Nature*, Vol. LXI. p. 368 (1890).

Test of adult female (*figs.* 1–4) subglobular or hemispherical, rather longer than broad, completely enclosing the insect; compact, glassy, brittle, roughened with numerous irregular waxy granules, which have a more or less conical form towards the margins and give to the test the appearance of being closely set with grains of white quartzy sand. In some examples the granules are spiculate. A small oval aperture at posterior extremity. After gestation the shrunken body of the insect is seen as a brownish patch at the anterior extremity of the test, the remaining cavity being filled and tinted by the pinkish eggs. Length 3 mm. Breadth 2·25 mm.

Adult female olive brown, broadly elliptical or subcircular, moderately convex above During gestation the abdomen becomes elevated until its ventral area assumes a position at right angles to the thorax (*fig.* 5), but the dorsum remains tumid until all the ova have been expelled. In parasitised examples the body retains its natural position and the derm becomes very dense and dark coloured. Antennæ (*fig.* 6) relatively stout, eight-jointed, the individual joints short but somewhat widely separated by intersegmental tissue, though the division between the seventh and eighth joints is sometimes rather obscure. (This division has apparently been overlooked by Maskell, who describes the antenna as seven-jointed.) The terminal joint bears four or five stout hairs at its apex, and there is a stout curved bristle on the side of each of the three terminal joints. In some Indian examples, on *Oscimum sanctum*, the antennæ are proportionately longer. Legs comparatively small, but stout and well developed; tibia as long as femur (without trochanter); tarsus about two-thirds the length of the tibia; ungual digitules broadly dilated; tarsal digitules knobbed. Under surface of abdomen with largish circular glandular pores arranged in transverse series along the posterior margin of each segment. Margin with a fringe of pointed stout conical spines in an irregular double series, those of the outermost series longer, and increasing in size towards the posterior extremity (*fig.* 7). Stigmatic spines single, long, slender, curved, sharply pointed; often mounted on a conspicuous marginal prominence (*fig.* 8). Valves of anal operculum widely separated (*fig.* 9); incrassate; rounded externally, inner edge irregularly sinuate; two or more pointed spines near the apex, and one or two hairs on the inner edge. Anal ring with eight hairs, six of which are long and stout, the remaining two small and inconspicuous. In older examples the small pair of hairs is not always apparent, and is always difficult to demonstrate except when the retractile tube is inverted. (Maskell, *loc. cit.*, erroneously states that the ring bears 'very numerous hairs, having

apparently been misled by the fluting of the retractile tube in which the hairs lie.) Length 2 to 2·75 mm. Breadth 1·75 to 2·25 mm.

Male puparium (*fig.* 10) oblong; colourless; surface closely granulated, the granules prominent and subconical, especially towards the margin where they form an irregular fringe. A large circular granulated hinged operculum closes the posterior extremity. Length 1·50 mm. Breadth 0·75 mm.

Adult male (*fig.* 11) pale reddish fulvous; head suffused with purple; apodema and margins of notal plates castaneous; ocelli black; costal nervure of wings pink. Antennæ ten-jointed; first two joints short and broad (the second almost globular); others elongate and narrow, irregularly rugose, hairy; tenth joint with three or four long knobbed hairs at the apex. (Maskell describes the antenna as nine-jointed; he has apparently overlooked one of the small basal joints.) Ocelli eight, large and prominent, four on upper (*fig.* 13) and four on under surface (*fig.* 14). Eyes rudimentary, colourless, situated on the upper surface of the genæ. Legs slender; foot with four knobbed digitules. Genital sheath sharply pointed, about half length of abdomen. Terminal segment of abdomen with a pair of long opaque white filaments. Length (including genital sheath) 1·50 mm. Expanse of wing 2·50 mm.

Young larva (*fig.* 15) pale pinkish orange. Dorsum with transverse series of rounded colourless glassy granules. Anal lobes each with a long seta. Antennæ six-jointed, with a long hair on the side of the terminal joint. Stigmatic spines very long and slender.

Older larvæ have a more or less distinct dorsal ridge. The dorsum is closely covered with irregular glassy conical processes, each surmounted by a glassy spine (*fig.* 16). Several longish tubular glassy filaments towards the posterior extremity. A complete marginal fringe of glassy cylindrical processes, the extremity of each abruptly tapering like a cedar pencil (*fig.* 17).

On *Abrus precatorius* (*fig.* 1); Chilaw (September); collected by Mr. John Pole. On *Atylosia candollei;* Hakgala (February). Occurs also on various plants in India.

EXPLANATION OF PLATE CVIII.

Ceroplastodes cajani.

Fig. 1. Insects clustered on stem of *Abrus precatorius*, nat. size.
2. Test of adult female, dorsal view, × 8.
3. „ „ ventral view, × 8.
4. „ „ side view, × 8.
5. Adult female, removed from test, postero-lateral view, × 12.
6. „ antenna, × 250.
7. „ spines of posterior margin, × 250.
8. „ stigmatic spine, × 250.
9. „ anal operculum, × 450.
10. Male puparium, × 13.
11. Adult male, × 10.
12. „ head, side view, × 30.
13. „ „ dorsal view, × 30.
14. „ „ ventral view, × 30.
15. Young larva, dorsal view, × 75.
16. Dorsal processes of older larva, × 250.
17. Marginal process of „ × 250.

CEROPLASTODES CHITON, *sp. nov*

(Plate CIX.)

Test of adult female (*figs.* 1, 2) oblong oval, narrower behind; strongly convex; glassy, brittle; dorsal surface with symmetrically disposed longitudinal series of irregularly polygonal waxy plates, each plate of a depressed conical form, with radiating ridges and striæ and concentric corrugations, the apex sometimes submucronate; margin closely studded with prominent conical points. Colourless or faintly tinged with green; the reddish brown colour of the shrunken insect showing through the thinner parts of the anterior half. Length 6·50 mm. Breadth 3·50 to 4 mm. Height 3 mm.

Adult female differs from *cajani* in the larger limbs and antennæ, and in the proportional lengths of the joints of the latter (compare Plate CVIII. *fig.* 6 and Plate CIX. *fig.* 3, both being drawn to the same scale). Antennal formula 3, 1 (2, 4, 5), (6, 7, 8). Other characters as in *cajani*. Length 3 to 3·25 mm. Breadth 2 to 2·50 mm.

In the earlier stages the plates are not so well defined, and have a granular surface.

Male puparium as in *cajani*. Length 2 mm.

Adult male not observed.

On *Cassia* sp. Maha Illuppalama, N.C. Province. September.

Readily distinguishable from *cajani* by its greater size, by the symmetrically disposed plates on the female test, and by the more elongate antenna.

EXPLANATION OF PLATE CIX.

Ceroplastodes chiton.

Fig. 1. Insects on twig of *Cassia*, nat. size.
2. Test of adult female, dorsal view, × 8.
3. Antenna, × 250.
4. Foot, × 450.
5. Stigmatic and marginal spines, × 250.
6. Posterior extremity, with everted anal tube, × 100.

CEROPLASTODES VIRESCENS, *sp. nov.*

(PLATE CX.)

Early adult female (*figs.* 1–3) with dorsum covered with minute waxy spicules and hairlike filaments; of a dull green tint.

Later, when the permanent test is in process of formation, there are indications of tessellation, the hairlike filaments disappear, except at the margin, and the spicules become larger and more prominent.

The available material does not include examples of the fully formed test or of the insect after gestation, but the latter doubtless shrinks into the anterior portion of the test, the hinder parts being filled with ova—as in other species of the genus.

Denuded insect dull olive green; derm coarsely mamillate. Antennæ (*fig.* 4) eight-jointed; third joint longest, but approximately equal to fourth and fifth; sixth, seventh, and eighth shortest and equal; formula: 3, (4, 5), (1, 2), (6, 7, 8). Stigmatic spine (*fig.* 5) long and slender. Marginal spines (*fig.* 6) crowded, three or four deep. Length 2·25 to 3·50 mm. Breadth 1·75 to 2·75 mm.

On the terminal shoots of *Theobroma cacao.* Matale. December.

Though described from meagre and not fully matured material, the characters are sufficient to separate this from the other two species found in Ceylon. It approaches *chiton* in the form of the antenna, but differs from its allies in the arrangement of the marginal spines (see *fig.* 7), and in the distinct green colour of the early test. In both *cajani* and *chiton*, the marginal spines are only 2-deep.

EXPLANATION OF PLATE CX.

CEROPLASTODES VIRESCENS.

Fig. 1. Insects on terminal shoot of *Theobroma cacao*, nat. size.
2. Early adult female, dorsal view, × 7.
3. „ „ ventral view, × 7.
4. Antenna of fully grown female, × 250.
5. Stigmatic spine, × 250.
6. Marginal spines, × 250.
7. Plan showing disposition of marginal spines, × 250.

ACLERDA, *Signoret.*

Aclerda, Sign., *Ann. Soc. Fr.* (5), Vol. IV. p. 96 (1896).
Pseudolecanium, Ckll., *Proc. Acad. Nat. Sci. Ph.*, p. 262 (1899).

Signoret defines his genus as follows:—'Very near to *Lecanopsis*, Targ. Tozz., from which it is distinguished by the absence of antennæ and feet in the adult. The body is thick, fleshy, almost soft, more or less hemispherical oval, but affecting however various forms, according to the place of attachment.' This author was acquainted with a single species only, *A. subterranea.* In subsequently discovered species the form of the body is considerably modified by the habitat, most of the species being found beneath the ensheathing leaf-stalks of various gramineous plants.

I cannot agree with Signoret in attributing to this genus any close relationship to *Lecanopsis*, which is a typical Lecaniid. It is at present convenient to include *Aclerda* in this family, but it is extremely aberrant, and a careful study of the morphology of the terminal segments of the body throws some doubt upon the correctness of the generally adopted position. At the same time, it must be acknowledged that the characters are still more unlike those of any other known family of Coccidæ.

The anal segment, in the adult female, is characterised by an undivided median plate enclosed in a somewhat deep cleft. In certain species (*e.g.*, *berlesii*) this median process is partially divided at the apex, but I am doubtful if this really indicates a fusion of two original pieces. The anal tube breaks up, towards its outer extremity, into numerous hair-like points, which do not appear to partake of the character of the spiniform hairs of the anal ring in the typical *Lecaniinæ.* There are no stigmatic clefts or specialised stigmatic spines. The antennæ are represented only by minute setiferous tubercles.

In the early larval stage of *A. distorta* (the only species in which the larva appears to have been studied), the anal segments show characters suggestive of both *Dactylopiinæ* and *Lecaniinæ.* There is a pair of fleshy tubercles, each having a stout seta, as in the former family, and between them a pair of thin conical plates suggestive of the valves of the anal operculum in *Lecaniinæ*, from which however they differ in the absence of the usual setæ. Between these, again, is a small median plate which appears to be peculiar to the species of this genus, and to those of *Cerococcus* (*Asterolecaniinæ*).

The genus, though containing comparatively few species, occurs over a wide area. Species are recorded from Europe, the southern States of America, Natal, Japan, and India.

ACLERDA DISTORTA, *sp. nov.*

(PLATE CXI.)

Adult female (*figs.* 6, 7, 8, 10, 11, 12) usually narrow and elongate, the form depending upon the size of the branch upon which it is situated. When occurring upon thicker branches, the body is proportionately stouter (*fig.* 10). The posterior extremity is pygidiform, and is at first symmetrical, but afterwards becomes distorted and turned at right angles to the main axis of the body (*fig.* 12), in which position the anal extremity is exserted from the side of the ensheathing base of the leaf (*fig.* 11). The under surface of the body is concave, being shaped to the support. Body at first milky white and soft, the posterior extremity and postabdominal margin castaneous (*figs.* 7, 8). Later, the body becomes tinged with pink (*figs.* 10, 12), and the castaneous area is gradually extended with the deposition of denser chitin until finally the whole of the derm may become hardened and of a reddish colour (*fig.* 6). A slight fringe of white waxy matter surrounds the insect, and some white waxy filaments are secreted around the abdominal extremity (*fig.* 8). Eyes obsolete. Mouth parts approximately central, often displaced towards one side; mentum monomerous. Spiracles large and conspicuous; reddish; the aperture of each with a crowded group of parastigmatic glands in a densely chitinous border. Abdominal margin thrown into irregular thickened folds and wrinkles. Anal extremity produced into two short, blunt processes, with a distinct median cleft. On the extreme inner edge of each process is a small but prominent laminar point (*figs.* 16, 17). Apex of processes with numerous stout hairs, and with many similar but slightly smaller hairs on their dorsal surface. A conspicuous dorsal linear series of circular pores on each side of the cleft (*fig.* 16), and some scattered thick-rimmed pores above the anal aperture. Ventral surface without pores or circumgenital glands. Owing to the densely chitinous character of the terminal segments, it is difficult to determine the exact position and nature of the several parts. There is an ovoid median undivided dorsal plate, bearing on its margin from eight to ten stout hairs, and covering the extremity of the anal tube. The margins of the cleft are densely thickened, with more or less definite boundaries. There is a retractile anal tube, open on under surface, apparently composed of numerous flattened hairs, which are confluent on the basal half but separate towards the extremity. Mr. Newstead describes this organ (in *A. japonica*) as composed of distinct but closely approximated hairs; but in the present species the hair-like processes are certainly confluent below, not merely contiguous. In some of my mounted examples this organ has become partially extruded, and its tubular character—split into hairs at the extremity—is quite clear. Margin of abdomen with a few scattered pointed spines (*fig.* 20), which are replaced on the thoracic margin by short, stout, acorn-shaped processes associated with tubular canals (*fig.* 19). Similar processes are more thickly scattered over the marginal area of the

cephalic extremity. There are no specialised stigmatic spines. Length of narrow form, 8 to 10 mm. Breadth averaging 2·50 mm. Broad form 8 by 4 mm.

Nymph (*fig.* 9) similar in form to adult, but posterior extremity more rounded (*fig.* 18), never distorted; margin with numerous small rounded or bluntly fusiform processes. Length 2·50 to 3·50 mm. Breadth averaging 1 mm.

Male puparium (*fig.* 5) oblong oval, narrow, flattish; very obscurely divided into plates; glassy, colourless, frosted; surrounded by an irregular fringe of white waxy matter. Length 2·50 mm. Breadth 0·75 mm.

Adult male (*fig.* 1) very pale reddish; ocelli black. Elongate, narrow. Antennæ and legs long and slender. Ocelli four (two dorsal and two ventral); eyes minute, rudimentary, lateral. Terminal joint of antenna with three (sometimes four) long, knobbed hairs, each almost as long as the joint itself. Wings long and narrow, slightly tinged with brown; costal nervure very pale pink. Halteres apparently wanting. Notal plates of mesothorax small; scutellum unusually large and elongate, considerably longer than the pro- and mesothorax together. Genital sheath slender, pointed, almost equal in length to the penultimate segment of abdomen. Extremity of abdomen with a short seta, and a few small hairs on each side. Length (including genital sheath) 1·60 mm. Expanse of wings about 3 mm.

Young larva (*fig.* 13) oblong oval, narrow; indented at point of insertion of antennæ and at the boundaries of the mesothorax. Colour milky white. Legs long and slender. Antennæ short, six-jointed. Eyes black, marginal, prominent. Extremity of abdomen (*fig.* 14) with a pair of rounded, fleshy lobes, each bearing a long seta on a globular base, which appears to be homologous with the marginal bulbular spines. Between the lobes is a pair of small pointed chitinous plates (suggestive of the lobes of the anal operculum in *Lecanium*), and a small median plate with rounded posterior border, which assumes a prominent position in the adult insect. Margin (*fig.* 15) with a series of remarkable bulbular spines alternated with slender-pointed spines with dilated bases (two of each form on thoracic and one of each on abdominal segments). Some of the bulbular spines have the form of a mucronate sphere; others appear to be cup-shaped, with the spine on one lip; others, again, are unarmed. Length 0·75 mm.

The insect appears to be ovoviviparous. No eggs have been observed; but young larvæ appear when females are kept alive.

At the final ecdysis the adult insect at first lies free within the skin of the nymph.

Concealed beneath the ensheathing bases of the leaves of *Arundinaria* sp. Pundaluoya, Yatiyantota, Udagama.

EXPLANATION OF PLATE CXI.

Aclerda distorta.

Fig. 1. Adult male, dorsal view, × 20.
2. „ „ underside of head, × 20.
3. „ „ terminal joint of antenna, × 170.
4. „ „ foot, × 170.
5. Male puparium, × 10.
6. Branch of *Arundinaria*, with insects *in situ*, nat. size.
7. Early adult female, ventral view, × 8.
8. „ „ „ dorsal view, × 8.
9. Female, second stage, dorsal view, × 8.
10. Adult female, broad form, from larger branches, × 3.
11. Portion of stem, enlarged, showing insect *in situ*, × 5.
12. Adult female, narrow form, side view, × 5.
13. Young larva, dorsal view, × 40.
14. „ „ posterior extremity, dorsal view, × 450.
15. Abdominal margin of slightly older larva, × 450.
16. Posterior extremity of adult female, dorsal view, × 250.
17. „ „ „ „ ventral „ × 250.
18. Posterior extremity of nymph, dorsal view, × 250.
19. Thoracic margin of adult female, × 450.
20. Abdominal margin of adult female, × 450.

CHAPTER VII.

ASTEROLECANIINÆ.

(PLATE CXXXII.)

IN my earlier synopsis of sub-families of the Coccidæ (Part I. p. 16), *Asterolecanium* and its allies were included with the *Dactylopiinæ*, with which they have many general characters in common. But, after a more particular study of these genera, I have been impressed with the feeling that they form a well-defined natural group that may conveniently rank as a separate sub-family. The salient character of the group is the possession—in one or more stages of the development—of peculiar paired (8-shaped) dermal glands.

The sub-family may be defined as follows :—Species normally secreting horny or waxy tests, freely separable from the insect. Derm—in one or more stages—with well-defined paired glands. Limbs rudimentary or wanting. Anal ring normally setiferous.

The tests secreted by members of the several genera are somewhat diverse. In *Asterolecanium*, this covering is thin and usually translucent. It is rapidly dissolved in caustic potash. In typical *Pollinia* (founded upon a single species), the test is of a waxy consistency and opaque. The species now added to this genus has a covering very closely resembling that of *Asterolecanium*. In *Lecaniodiaspis*, the envelope is stouter and more opaque ; in some species it may be described as of almost a ligneous consistency. It resists, to a great extent, the action of caustic potash. The test of *Cerococcus* is largely composed of waxy matter, and breaks up, more or less completely, in boiling potash. The aberrant genera, *Amorphococcus* and *Anomalococcus*, are naked.

The paired (8-shaped) dermal glands (*fig.* 4) are a characteristic feature of all the members of the group in the larval stage, and are well developed in the adult stages of *Asterolecanium* and *Cerococcus*. In the former genus, they are responsible for the

secretion of peculiar glassy filaments; while, in *Cerococcus*, they are concerned in the production of bundles of filaments that are often massed together into compact tapering processes. They occur, in a minor degree, on the adult female of *Lecaniodiaspis*, and, in a modified form, in the adult *Anomalococcus*. Their usual form may be more appropriately described as double reniform, the contiguous margins being flattened or slightly concave. In most members of the family, these organs are confined to the dorsal surface; but, in *Cerococcus*, a few paired glands—usually of a smaller size—are found on the ventral surface of the abdomen.

Small tubular glands (*fig.* 5), scattered thickly all over the derm, are common to all members of the *Asterolecaniinæ*. I believe them to be especially concerned in the secretion of the homogeneous area of the test.

Special organs, consisting of densely chitinous circular pitted plates (*fig.* 7), occur on the dorsal surface of the abdomen in *Lecaniodiaspis*, *Anomalococcus*, and *Cerococcus*. They have been termed 'cribriform plates.' Their function is obscure, no corresponding special feature being noticeable upon the covering test of such species.

Stigmatic spines occur in species of the genera *Lecaniodiaspis* and *Anomalococcus*, suggesting that these genera form a connecting link with the *Lecaniinæ*.

The anal segment, though possessing general characters common throughout the group, shows considerable diversity in the different genera. In *Asterolecanium* (*fig.* 1), the caudal setæ arise from minute lobes, between which is usually a second pair of still smaller lobes or tubercles, each with a strong spine on its apex. The walls of the anal tube are usually thin, with the exception of the dorsal lip which takes the form of a more densely chitinous transverse plate. Occasionally the whole lining of the anal tube is densely chitinous. The anal ring normally carries six stout hairs; but in a few species these appear to be suppressed. In *Lecaniodiaspis* (*fig.* 3), the anal aperture is guarded above by a median transverse chitinous plate (the dorsal lip) which is more or less excised on its posterior margin. A large bilobed plate (or dermal thickening) extends immediately below the aperture. This plate, though superficially resembling the anal valves of the *Lecaniinæ*, is not free, but closely adherent to the body. The caudal setæ are mounted on small chitinous tubercles. The anal ring carries a varying number of stout flattened hairs. The posterior

extremity of the body may be deeply cleft or merely slightly indented. In *Cerococcus* (*fig.* 2), the anal lobes are strongly developed, resembling in character those of the Dactylopiine genus *Eriococcus*. The dorsal lip of the anal aperture is prolonged in the form of a prominent triangular median plate which projects between the bases of the anal lobes. The anal ring carries eight stout flattened hairs.

Amorphococcus and *Anomalococcus* may be regarded as aberrant forms of *Asterolecanium* and *Lecaniodiaspis* respectively, their divergence from the type being due to exceptional environment.

I have included, in the following synopsis, only the six genera that occur in Ceylon. It is probable that several of the aberrant gall-making Coccids of Australia will fall into this same group. *Frenchia* is almost certainly an Asterolecaniid.

Synopsis of Ceylon Genera.

A. Cribriform plates on dorsum of adult female.
- *a.* Antennæ well developed; stigmatic spines present; anal lobes small.
  - *a*[1]. Insects with complete tests .... LECANIODIASPIS.
  - *b*[1]. Insects naked; inhabiting ants' nests ANOMALOCOCCUS.
- *b.* Antennæ rudimentary; no stigmatic spines; anal lobes large .... CEROCOCCUS.

B. Without cribriform plates on dorsum of adult female.
- *a.* Test of adult female with marginal fringe of glassy filaments .... ASTEROLECANIUM.
- *b.* Test of female without fringe .... POLLINIA.
- *c.* Insects naked; gall-making .... AMORPHOCOCCUS.

EXPLANATION OF PLATE CXXXII

ASTEROLECANIINÆ.

Fig. 1. Anal segment of *Asterolecanium.*
2. „ „ *Cerococcus.*
3. „ „ *Lecaniodiaspis.*
4. Paired dermal glands ;
   (*a*) from *Asterolecanium aureum.*
   (*b*) from *Cerococcus albospicatus.*
   (*c*) from *Lecaniodiaspis azadirachtæ*
   (*e*) from *Anomalococcus cremastogastri.*
5. Tubular dermal glands ;
   (*a*, *b*) from *Asterolecanium aureum.*
   (*c*) from *Lecaniodiaspis malaboda.*
6. Ceriferous glands ;
   (*a*) from *Asterolecanium rubrocomatum.*
   (*b*) from *Cerococcus albospicatus.*
   (*c*) from *Lecaniodiaspis malaboda.*
7. Cribriform plates ;
   (*a*) from *Cerococcus albospicatus.*
   (*b*) from *Lecaniodiaspis azadirachtæ.*

LECANIODIASPIS, *Targioni-Tozzetti.*

Lecaniodiaspis, Targ., *Bull. Soc. Ent. Ital.*, p. 261 (1869).
Prosopophora, Dougl., *Ent. Mo. Mag.*, p. 207 (1892).
Birchippia, Green, *Ann. Mag. Nat. Hist.* (7), Vol. VI. p. 450 (1900).

Adult female enclosed in a compact tough opaque test, which subsequently forms a receptacle for the ova. Surface usually with longitudinal and transverse ridges enclosing depressed areolæ. Occasionally with waxy processes on the dorsum. A small oval aperture, near the posterior extremity, through which the larvæ make their escape. Varying in convexity from flat to almost hemispherical. In some species the insect rests in a shallow pit or depression in the bark of the plant.

Adult female insect either apodous or with extremely rudimentary limbs. Antennæ usually well developed, of from four (*acaciæ*) to nine (*sardoa*) joints. Mentum monomerous. Anal segment more or less cleft; the base and inner sides of the cleft guarded ventrally by a bilobed chitinous thickening of the derm which simulates the anal lobes of the *Lecaniinæ*. A transverse median plate with emarginate outer edge, forming the dorsal lip of the anal aperture. Anal ring with from eight to twelve stout flattened hairs. A pair of stout setæ, one on each side of the anal cleft. Stigmatic spines always present; usually one or two on the margin opposite each spiracle, and occasionally at a point midway between them. Derm with paired (8-shaped) glands in greater or less abundance. On the dorsal surface of the abdomen are two series of circular chitinous plates bearing translucent pits or pores. These have been termed 'cribriform plates,' from a fanciful resemblance to a sieve. Their function is obscure.

Male puparium of similar texture to that of female; but smaller and narrow oblong; with a large circular operculum above the posterior extremity.

Examples of the genus are widely distributed throughout both hemispheres. Two species occur in Ceylon.

Synopsis of Ceylon Species.

A. Test of female only slightly convex; resting in a shallow depression in the bark of the plant, without waxy processes. Dorsum of adult female insect with numerous stout conical spines .... *azadirachtæ*, p. 298.

B. Test of female strongly convex: bearing five longitudinal series of white waxy-pointed processes. Adult female insect without spines on dorsum ... *malaboda*, p. 300.

LECANIODIASPIS AZADIRACHTÆ, *sp. nov.*

(PLATE CXII.)

Test of adult female (*figs.* 1, 2) broadly oval; slightly convex above and below. Surface minutely pitted. An interrupted median longitudinal carina; and about ten transversely radiating carinæ on each side, with slightly raised bosses at two points; the raised parts of both longitudinal and transverse carinæ rendered more conspicuous by a thin covering of whitish waxy secretion. Short carinæ above the stigmatic areas. A short cleft at posterior extremity, expanding into a narrow anal aperture. Margin densely tomentose. Ventral area of test very thin, adherent to the bark of the plant. Colour, brownish ochreous. Length 3·25 mm. Bieadth 2·25 mm.

Living insect, after oviposition (*fig.* 3), ochreous yellow. Anterior margin infolded on each side of the cephalic area. Sides flattened and broadly rounded. Abdominal area contracted and concealed beneath the overlapping thoracic and lateral areas. Antennæ eight-jointed (*fig.* 4). Limbs (*figs.* 9, 10) distinctly two-jointed, comparatively large; the distal joint soft and colourless. Stigmatic spines (*fig.* 5) somewhat clubbed, two at anterior and one at posterior stigmatic areas; each with a slight groove on distal half. Anal segment (*fig.* 6) with a broad bilobed chitinous plate below anal aperture, its sides with denser folds: the pre-anal plate with a deep semicircular emargination behind. Anal ring with ten stout flattened hairs. Close to the apex of each lobe of the postanal plate is a stout seta springing from a small tubercle. A few stout-pointed spines outside the base of each seta. A few whip-like hairs, and some inconspicuous circular pores, near extremity of venter. Dorsum with numerous stout conical sharply pointed spines (*fig.* 11), more crowded on the marginal area. Cribriform plates (*fig.* 7) small, with well-defined circular pits. Diameter approximately 1·5 mm.

Male unknown in any stage.

On young branch of *Azadirachta indica* ('margosa'). Jaffna. The bark beneath the insect is sunk, forming a shallow cavity in which the insect rests (*fig.* 1). The surrounding parts are somewhat swollen.

Described from a single example. The species is well characterised by the stout conical spines on the dorsum.

EXPLANATION OF PLATE CXII.

LECANIODIASPIS AZADIRACHTÆ.

Fig. 1. Insects on branch of *Azadirachta*, nat. size.
2. Test of female, dorsal view, × 12.
3. Female insect, dorsal view, × 25.
4. Antenna, × 250.
5. Stigmatic spines, × 450.
6. Anal segment, dorsal view, × 250.
7. Cribriform plate, × 450.
8. Paired glands, × 600.
9. Anterior limb, × 250.
10. Posterior limb, × 250.
11. Dorsal spines, × 450.

LECANIODIASPIS MALABODA, *sp. nov.*

(PLATE CXIII.)

Test of adult female (*figs.* 1 to 4) oval, more or less pointed behind ; strongly convex above ; with faint transverse and longitudinal ridges (*fig.* 4). On fresh examples (*figs.* 2, 3) there are five longitudinal series of opaque white waxy processes, broad at the base, tapering to a point at the apex. In worn examples, these processes may be represented only by small pads of white wax, or may be entirely wanting (*fig.* 4). The test itself is of a very compact tough material ; dull brown to reddish brown in colour. The posterior extremity is cleft by a narrow elongated anal aperture, with raised margins. Length 3·5 to 5 mm. Breadth 2·5 to 3·75 mm.

Male puparium (*fig.* 5) oblong, rounded at the extremities. Posterior extremity with a large circular operculum. A very inconspicuous median carina. Colour and texture similar to that of female. The single specimen obtained is old and worn. Fresh examples may possibly show waxy processes corresponding to those of the female. Length 2 mm. Breadth 1 mm.

Adult female insect (*fig.* 6) broadly oval ; strongly convex above. Antenna (*fig.* 7) with eight distinct joints ; the apex with several stiff curved hairs ; a single curved hair on the side of each of the sixth and seventh joints. Stigmatic spines well developed ; usually two opposite the anterior, and one opposite the posterior stigmata ; each spine grooved for the greater part of its length (*fig.* 8). Limbs rudimentary ; the anterior pair jointed, the joints swollen and globose (*fig.* 9) ; the other limbs consisting of a single stout piece, with rudimentary claw and digitule at the apex (*fig.* 10). Anal segment (*fig.* 12) deeply cleft ; the cleft enclosed ventrally by a large densely chitinous bilobed dermal plate, each lobe of which is approximately triangular. The median dorsal plate also is bilobed behind, but the emargination is comparatively small, and the apices of the lobes are broadly rounded. There are two small straight setæ—one on each side—crossing each other at the opening of the cleft. The anal ring carries eight stout hairs, each of which is flattened and expanded in the middle, tapering to a fine point at the extremity (*fig.* 13). The margins of the cleft and the adjacent area bear numerous minute spicules. The area on each side of the anal plates is crowded with thick-rimmed circular pores ; similar pores are thickly strewn over the ventral surface of the abdomen, in the form of broad transverse bands across the segments. The whole dorsal surface is strewn with 8-shaped glands, which are of several sizes, the smallest being on the abdominal segments. There are six cribriform plates, arranged in two longitudinal series on the abdomen. They are rather densely chitinous, with the pits arranged in dense clusters (*fig.* 11). There are a few small spiniform hairs on the marginal area. A series of minute multiocular pores connects each spiracle with the corresponding stigmatic spines. Length 2·5 to 3 mm. Breadth 2·25 to 1·5 mm.

Adult male unknown.

Newly hatched larva oblong, rounded in front, tapering behind. Anal aperture guarded by three chitinous plates, as in adult. Anal ring with six hairs. Antennæ six-jointed. Margin of body with some small spiniform hairs; some longer whip-like hairs on the venter. Stigmatic spines as in adult. A marginal and three longitudinal dorsal series of small 8-shaped glands. Legs normal; the tarsus longer than tibia.

On *Myristica laurifolia* ('malaboda'); Pundaluoya. On *Bocagea obliqua*; Watawella.

EXPLANATION OF PLATE CXIII.

Lecaniodiaspis malaboda.

Fig. 1. Insects on branch of *Myristica*, nat. size.
2. Fresh test of adult female, dorsal view, × 12.
3. " " side view, × 12.
4. Worn test of female, side view, × 12.
5. Male puparium, dorsal view, × 15.
6. Adult female insect, optical section, × 25.
7. Antenna of adult female, × 250.
8. Anterior stigmatic spines, × 450.
9. Anterior rudimentary limb, × 450.
10. Mid limb, × 450.
11. Cribriform plate, × 450.
12. Anal segment, × 250.
13. Hair from anal ring, × 450.

ANOMALOCOCCUS.

Anomalococcus, Green, *Ent. Mo. Mag.*, Vol. XXXVIII. p. 260 (1902).

Insects naked or coated with waxy powder. Antennæ well developed. Limbs wanting. Mentum monomerous. Stigmatic spines present in larval and nymphal stages. Paired dorsal glands of the shape of double flasks, united by their bases. Cribriform plates numerous. Anal aperture enclosed between two (anterior and posterior) semicircular plates. Anal ring setiferous.

Male puparium similar to that of *Lecaniodiaspis*.

Adult male with well-developed halteres.

Founded upon a single species inhabiting shelters constructed by an arboreal ant. It is probable that the protection afforded by this habitat has led to the suppression of the covering test usual to members of the sub-family.

ANOMALOCOCCUS CREMASTOGASTRI, *Green.*

(Plate CXIV.)

Anomalococcus cremastogastri, Green, *Ent. Mo. Mag.*, Vol. XXXVIII. p. 261 (1902).

Adult female (*figs.* 1–3) naked, or thinly dusted with waxy powder. Form oval, broadest behind; with deep stigmatic and anal clefts, the latter not reaching the anal aperture (*fig.* 11). Strongly convex above; at first more or less evenly rounded (*fig.* 2); older individuals with prominent median longitudinal and two transverse ridges (*fig.* 3). A stout opaque white waxy process projects from each of the stigmatic areas, and a similar, but tubular, process arises from the anal aperture, frequently surmounted by a globule of viscid colourless fluid (*fig.* 3). Colour, at first greenish grey; later, slaty grey. Antennæ (*fig.* 12) of eight joints, the terminal three smallest. Limbs altogether absent. A densely chitinous paraphysis extends inwards from each stigmatic cleft, enclosing the spiracles. There are no stigmatic spines: but the dorso-marginal area of the stigmatic cleft is set with many fine hairs (*fig.* 14). Anal aperture (*fig.* 13) oval: at some distance from margin: bordered by two densely chitinous semicircular plates, the anterior plate in the form of a narrow loop, the posterior plate broader, with recurved sides and concave hinder margin; anal ring with from 10 to 16 stout hairs; no caudal setæ. Dorsum thickly set with conspicuous oval and subcircular dermal cells (*fig.* 15), largest on the area immediately anterior to the anal aperture, where they enclose the cribriform plates (*fig.* 16). These latter are exceptionally numerous, extending in a dense group of from 100 to 150 across the median abdominal area (*fig.* 11). The paired dorsal glands are minute and modified in structure, being in the shape of two flasks united at their bases. They appear to be associated with the dermal cells (*fig.* 15). The insect is ovoviviparous. Length 3 to 4·75 mm. Breadth 2·5 to 3 mm.

Female nymph (*fig.* 9) flattish, with slight median ridge. Dorsum coated with a thin glassy secretion. Antennæ (*fig.* 10) of six stout joints. Limbs entirely wanting. Stigmatic spines present, but small and inconspicuous, one or two in each cleft, set back from the margin. A series of small marginal hairs. Anal aperture as in adult, but more circular, the posterior plate more widely expanded. Caudal setæ small, about twice the length of the marginal hairs. Dorsal paired glands minute, inconspicuous, of same form as in adult. Length approximately 1 mm. Breadth 0·65 mm.

Larva (*fig.* 6) distinctly Lecaniid in form, with well-marked anal and stigmatic clefts. Stigmatic spines small, stout and spatulate, one in each cleft (*fig.* 8). Antennæ six-jointed. Legs stout; the tibio-tarsal articulation obscure. Caudal setæ moderately long. Margin of body with a series of minute hairs. Derm with numerous minute paired glands similar to those of the later stages, and a few small hair-like spines. Anal aperture (*fig.* 7) circular, with anterior

and posterior semicircular plates, the latter excised on posterior margin. Anal ring with six hairs.

Male puparium (*fig.* 4) oblong, moderately convex above, more or less distinctly segmented, with inconspicuous rounded median longitudinal ridge. Posterior extremity with a large flat (or slightly concave) operculum. Colour pale ochreous. Surface granular. Length 1·5 mm.

Adult male pale castaneous ; notal plates darker. Wings ample ; costal nervure not, or only slightly, pigmented. Halteres with stout basal joint and long fine hooked bristle. Antennæ ten-jointed, with short fine hairs ; apex of terminal joint with a single long knobbed hair. Ocelli four, black, large and conspicuous. Eyes minute, colourless. Genital sheath long, slender, sharply pointed. A small lobe on each side of terminal segment, with short setæ and glandular pit ; but no waxy caudal filaments were observed. Length 1 mm.

On *Ficus religiosa*, *Ficus* sp., *Trema orientalis*, and *Feronia elephantum*. Peradeniya and Maha-Illupalama.

The insects, of all ages, are crowded on the smaller branches and invariably enclosed in shelters (*fig.* 1) constructed by an arboreal ant (*Cremastogaster dohrni*).

EXPLANATION OF PLATE CXIV.

ANOMALOCOCCUS CREMASTOGASTRI.

Fig. 1. Insects, in shelter constructed by ants, nat. size.
2. Early adult female, dorsal view, × 10.
3. Old adult female, side view, × 10.
4. Male puparium, side view, × 15.
5. Larva, shortly before moult, dorsal view, × 40.
6. Younger larva, ventral view, × 75.
7. Posterior extremity of young larva, dorsal view, × 250.
8. Margin of larva, showing stigmatic spines, × 300.
9. Early nymph, ventral view, × 40.
10. Antenna of nymph, × 450.
11. Adult female, optical section, × 25.
12. Antenna of adult female, × 250.
13. Anal aperture of adult female, × 250.
14. Stigmatic cleft of adult female, dorsal aspect, × 250.
15. Dermal cells of median area, × 450.
16. Dermal cells of abdominal area, × 450.

CEROCOCCUS, *Comstock.*

Cerococcus, Comst., *Rep. U.S. Dep. Agric.*, p. 213 (1882).
Solenophora, Mask., *N.Z. Trans.*, Vol. XXII. p. 139 (1889).
Solenococcus, Ckll., *Check List*, *Suppl.*, p. 392, note (1899).
Antecerococcus, Green, *Pr. Linn. Soc. N.S.W.*, p. 560 (1900).
Cercococcus, Scott, *Trans. Linn. Soc. Lond.*, Vol. IX. part 12, p. 455 (1907).

Adult female enclosed in a dense waxy test, with or without waxy or filamentous processes. Posterior extremity with a stout upturned tubular extension, at the apex of which is the anal aperture.

Adult female insect with the terminal abdominal segments usually abruptly narrowed. The extremity with two stout spiniferous lobes, each bearing a longish seta; the interno-ventral aspect of the lobes more densely chitinous; a prominent median triangular plate on the dorsal aspect; anal ring with eight stout hairs. Antennæ rudimentary. Limbs rudimentary or absent. Mentum dimerous. Derm with conspicuous paired (8-shaped) glands. Cribriform plates present on the dorsal surface of the abdomen. No stigmatic spines.

Male puparium with a large oval or circular operculum above the posterior extremity.

The type species (*quercus*) was described by Comstock from Arizona (U.S.A.). Under the name of *Solenophora*, other species were recorded from New Zealand, by Maskell. Owing to preoccupation, this name was altered by Cockerell to *Solenococcus*. The genus *Antecerococcus* was founded by the author upon immature material received from Australia. The synonym *Cercococcus*, given by Scott to a species from Algeria, is the result of a similar misconception. The genus is represented in India.

Synopsis of Ceylon Species.

A. Limbs absent. Test with stout crimson waxy processes *ornatus*, p. 306.
B. Rudimentary limbs present.
  a. Test with long creamy-white waxy processes...... *albospicatus*, p. 308.
  b. Test covered with pale rose-coloured fibrous tufts and processes .... *rosea*, p. 310.

CEROCOCCUS ORNATUS, *sp. nov.*

(PLATE CXV.)

Test of adult female (*figs.* 2-6) irregularly oval, the posterior extremity (in fully matured examples) produced into a short upturned tube (*fig.* 5). In earlier examples this caudal extension is in the form of a trough, partially closed above by stout curling filaments. Dorsum strongly convex, the sides sloping inwards to the comparatively narrow ventral area (*fig.* 6), which is thin and easily ruptured. Dorsum with three prominent transverse waxy ridges produced, at the middle and two sides, into stout pointed processes : the lateral processes longest, tapering to fine points, and projecting (in fresh examples) considerably beyond the margin, which is itself thickened and tubercular. Posterior margin with two or more tapering processes directed backwards. There are several pairs of short white curved filaments on the median line, behind the third transverse ridge. In older examples the waxy processes are gradually reduced until they practically disappear, and old worn tests are more or less globular in form. Colour of early test purplish brown ; the ridges, processes, and thickened margins bright coral-red or crimson (*fig.* 2). Older examples become at first uniform pale red (*fig.* 4), and finally dull reddish brown. There are two white waxy ridges on each of the sloping sides, extending from the first and third lateral processes, respectively, to the stigmatic openings. Length 2 to 2·50 mm. Breadth (exclusive of processes) 1·12 to 1·50 mm.

Male puparium (*fig.* 7) oblong, narrow, rounded at the extremities. An inconspicuous median and two prominent transverse ridges, the latter terminating laterally in pointed processes. A smaller pointed process, on each side, close to anterior extremity. Posterior third occupied by a large circular operculum with raised margins. Colour pale red to crimson. Length 1 mm. Breadth 0·45 mm.

Adult female insect (*fig.* 8) of a delicate greyish tint, in life. Broadly oval : the terminal segments abruptly narrowed. Abdomen terminating in two prominent irregularly conical lobes, with a bluntly conical median plate between them (*fig.* 9) ; each lobe with a triangular chitinous plate on its inner side and a longish stout seta at its apex. Ventral lip of anal aperture with four or more long stout spines. Anal ring with eight hairs. Rudimentary antenna (*fig.* 10) with from eight to twelve stout hairs on its apex. Limbs entirely wanting. Dorsum with numerous large and conspicuous paired glands, disposed principally in three broad transverse bands across the middle of the body (*fig.* 8), leaving the anterior and posterior areas comparatively free. The first and third bands divide near the margins, where they enclose a series of small circular glands (*fig.* 11). There is a straggling group of the large paired glands within the anterior margin ; a short marginal series on each side of the abdomen, just before the constriction ; and another short series, on each side, close to the

anal lobes. Amongst the larger paired glands, and scattered over other parts of the dorsum, are many of a much smaller size. Cribriform plates small, each with a broad densely chitinous border and areolate centre (*fig.* 13); in two groups of four, immediately anterior to the narrowed part of the abdomen. Venter with small circular glands in loose transverse series across the abdominal segments, and some scattered paired glands of the smaller size. Length 2 mm.

Adult male uniform dark brown. Wings hyaline; nervures colourless. Genital sheath (*fig.* 12) very broad at base; sharply pointed at extremity. Although the single example examined showed no waxy caudal filaments, there is a distinct glandular pit on each side, giving rise to fine paired setæ such as usually support caudal filaments. Length 1 mm. Expanse of wings 1·75 mm.

On bark of *Coffea arabica*; Pundaluoya. Also on *Carissa* sp.; Kaits Island.

The insects, at a casual glance, resemble the small tufts of red fungus commonly parasitic upon certain species of *Diaspidinæ*.

Hymenopterous parasites, bred from this species, have been determined by Ashmead as *Cephalota purpureiventris*, Motsch.

EXPLANATION OF PLATE CXV.

Cerococcus ornatus.

Fig. 1. Insects on bark of coffee tree, nat. size.
2. Early test of adult female, dorsal view, × 17.
3. „ „ ventral view, with part of test broken away, showing insect *in situ*, × 17.
4. Older test of female, dorsal view, × 17.
5. „ „ side view, × 17.
6. „ „ ventral view, × 17.
7. Male puparium, dorsal view, × 20.
8. Female insect, optical section, × 25.
9. Anal segment of female, × 250.
10. Antenna of adult female, × 450.
11. Part of marginal area, showing the several forms of glands, × 450.
12. Abdominal extremity of adult male, × 250.
13. Cribriform plate, × 600.

CEROCOCCUS ALBOSPICATUS, *sp. nov.*

(PLATE CXVI.)

Test of adult female (*figs.* 1, 2) with the dorsum almost completely concealed by large stout tapering pointed waxy processes, of a creamy white tint tipped with rosy pink. The processes are symmetrically arranged as follows—a single median process covering the anterior third of the test, directed forwards; six subdorsal processes, in three pairs, of which four are directed forwards and outwards, the remaining two outwards and backwards; a sublateral series of four on each side, radiating outwards; one pair directed from the anterior margin, and one pair from the posterior margin, encircling the upturned tubular anal extension. From the dorsal margin of the anal tube, two or more slender coral-red processes are directed forwards over the dorsum. From the base of and between the larger white processes are numerous short stout coral-red filaments. The small spaces showing between the processes and filaments are of a dull brown colour. Length (inclusive of processes) 5 mm. Expanse, from tip to tip of lateral processes, 6 mm.

Male puparium (*fig.* 3) oblong; uniform coral-red or crimson; with short stout pointed waxy processes of the same colour covering the anterior two-thirds of the dorsum; the hinder part occupied by a slightly concave oval operculum. Length 2 mm. Breadth, across the lateral processes, 1 mm.

Adult female broadly oval, the terminal segments abruptly narrowed and terminating in the usual pair of prominent setiferous lobes (*fig.* 5) and a triangular median plate. Anal ring with eight stout hairs. Large 8-shaped glands of two sizes (*fig.* 8) thickly scattered over the dorsum. The larger glands absent from the abdominal area. A few similar paired glands on the sides of the abdominal segments, and upon the anal lobes. Cribriform plates (*fig.* 6) cup-shaped, in two groups of from three to six, situated immediately anterior to the constricted area. Rudimentary limbs each in the form of a sessile claw (*fig.* 7). Length 3 to 3·25 mm. Breadth 2·50 mm.

Adult male unknown.

Young larva (*fig.* 4) narrow, pointed at the two extremities. Antennæ six-jointed. Anterior feet with three digitules (two ungual and one tarsal); the others with four digitules. Caudal setæ half length of body. Dorsum with six longitudinal series of large 8-shaped glands, the submarginal series on each side absent on the abdominal segments. Margin with very small inconspicuous hairs. Anal ring with six hairs. Length 0·65 mm.

On bark of *Symplocos obtusa.* Nuwera Eliya.

EXPLANATION OF PLATE CXVI.

Cerococcus albospicatus.

Fig. 1. Insects on bark of *Symplocos*, nat. size.
2. Test of adult female, dorsal view, × 10.
3. Male puparium, dorsal view, × 10.
4. Young larva, × 75.
5. Anal segment of adult female, optical section, × 250.
6. Group of cribriform plates, × 600.
7. Rudimentary limb, × 450.
8. Dorsal paired glands, × 450.

CEROCOCCUS ROSEUS, *sp. nov.*

(PLATE CXVII.)

Test of adult female (*fig.* 2) with dorsum completely concealed beneath dense conical or rounded tufts of rosy pink fibrous secretion, arranged, apparently, in four series, and a marginal series of tapering rose-red fibrous processes. Owing to the crowded disposition of the insects, I have been unable to determine the exact number and arrangement of the dorsal and marginal secretionary processes. It has been found impossible to isolate a single unbroken individual. The figure on Plate CXVII. is an attempt at a reconstruction, founded on many separate fragments. There is the usual elevated anal tube at the posterior extremity. Length (inclusive of processes) from 5 to 8 mm. Breadth, approximately, 5 mm.

Male puparium unknown.

Adult female insect broadly oval or approximately circular. Terminal abdominal segments abruptly narrowed; anal lobes typical of the genus, the setæ long and stout; median plate dentate on its distal margin (*fig.* 3); anal ring with eight stout hairs. Dorsum crowded with 8-shaped glands of two sizes (*fig.* 4), disposed in more or less definite vortices. Many small paired glands on venter of abdominal segments. Antennæ and limbs rudimentary, the latter in the form of stout curved claws. Cribriform plates (*fig.* 5) comparatively large, slightly concave; five or six on each side, usually in pairs, near base of abdomen. Length 2·5 to 3·5 mm. Breadth 2 to 3 mm.

On small branches of undetermined trees. Trincomali. Collected by Major Yerbury. The insects are crowded in dense masses, completely encircling the twigs, in such a manner that the form of the individuals is quite obscured.

EXPLANATION OF PLATE CXVII.

CEROCOCCUS ROSEUS.

Fig. 1. Insects massed on branch, nat. size.
2. Test of adult female, dorsal view, × 10.
3. Anal segment of female, from below, optical section, × 250.
4. Dorsal paired glands, × 450.
5. Cribriform plates, × 600.

ASTEROLECANIUM, *Targioni-Tozzetti.*

Asterolecanium, Targ., *Intr. 2nd Mem. Studi Cocc.*, Catalogue, p. 41 (1869); Sign., *Ann. Soc. Ent. Fr.* (4), Vol. X. p. 276 (1870).

Planchonia, Sign., *Ann. Soc. Ent. Fr.* (4), Vol. X. p. 282 (1879).

Asterodiaspis, Sign., *Bull. Soc. Ent. Fr.* (5), Vol. VI. p. ccix. (1876).

Female insect completely enclosed within a thin but compact horny test, characterised by a continuous marginal fringe of glassy filaments. The test may be hemispherical, flat, or even somewhat concave above. It varies in outline from circular to linear. The surface is usually smooth, with, in some species, erect or curling filaments on the disc, similar to those of the marginal series. In one species (*coronatum*) there is a series of pointed prominences on the dorsum. At the posterior extremity there is a small opening through which the larvæ escape. This aperture is sometimes placed at the end of a tubular extension which is often more or less elevated. The colour of the test is invariably of a greenish or yellowish tint, but the fringe and dorsal filaments are sometimes tinged with red. The structure of the fringe calls for more particular notice. In many species the filaments are so small, so imperfect, or so matted together, that their arrangement cannot be clearly distinguished. But, by analogy from the disposition of the glands by which they are secreted, the arrangement must be practically identical in all. In some of the larger species (*e.g.*, *bambusæ*, *aureum*, and *delicatum*) no such difficulty arises. In such species, there can be readily distinguished three distinct series of paired filaments:—(1) An outermost (imaginal) series, springing from the extreme margin, in which the filaments are placed side by side, with practically no interruption. (2) A dorso-marginal (nymphal) series, arising just within the margin and partly overlapping the outer series, the filaments usually more widely spaced and interrupted at more or less regular intervals. (3) An inner (larval) series, consisting usually of twenty-eight curling or crook-shaped paired filaments, very widely spaced, the anterior sixteen pairs with their two filaments divergent from the base, the remaining twelve pairs with coherent filaments curved towards the posterior extremity of the insect. The individual filaments of each pair in the two outer series are also usually more or less divergent towards their distal extrem ties, the point of separation varying in different species. A careful study of the development of the test, from the earliest stages, makes it clear that these three series are referable to the larval, nymphal, and imaginal stages of the insect respectively. The covering of the larval insect carries only a single series of crook-shaped filaments, placed directly on the margin. The nymphal covering has a continuous marginal fringe of straight or partially divergent filaments, and a submarginal series of crooked filaments, the latter having been carried over from the previous stage. The test of the adult female has three series, the outermost fringe being proper to the adult insect, while the other two are legacies from the previous moults. During the process of expansion by growth, the earlier series have become broken up and

discontinuous. The interruptions are more or less symmetrical, corresponding with the segmental lines of growth. When filaments occur on the disc of the test, they may originate either from the adult insect (in which case their position is indicated on the body of the insect itself by the presence of supplementary 8-shaped glands), or they may be referable to the earlier stages.

The adult female insect, denuded of its covering, is at first approximately of the same form as its covering. After oviposition it shrivels up and lies at the anterior extremity of the test, the remaining cavity being packed with ova. The antennæ are rudimentary, consisting of a single short joint with a few curved hairs at its extremity. The limbs are totally absent. Mentum monomerous. No stigmatic spines. Anal lobes absent or minute, usually represented by a pair of small tubercles each bearing a stout seta. In a few species, both tubercles and setæ are wanting. Between the setiferous tubercles are usually from two to four smaller tubercles, each bearing a small spine. The anal ring is sunk in a tubular pit which sometimes opens on to the extreme margin, but usually terminates shortly before the margin on the dorsal surface; it normally carries six stout hairs, but is sometimes hairless. The dorsal lip of the anal aperture is usually in the form of a more densely chitinous transverse plate. The genital aperture is very inconspicuous and obscure. In those species in which I have been able to locate the position of the vulva, it is situated on the ventral surface at some distance from the extremity, opening between the last two transverse series of ceriferous glands. The derm is very thin and delicate. It bears a large number of glands of different forms and functions. (1) Numerous delicate tubular glands of which the apertures are obscure. These are probably concerned in the secretion of the homogeneous body of the test. (2) Paired or 8-shaped glands disposed in a single (occasionally double) series around the dorsal margin, and sometimes at various points on the dorsum. These are undoubtedly responsible for the paired glassy filaments of the fringe. (3) A somewhat irregular series of small simple circular glands on the ventral margin, concerned in the secretion of a white powdery wax which usually underlies the fringe. The greater or less abundance of this deposit is strictly correlated with the number of the ventro-marginal glands. Similar glands extend from the four stigmata to the margin, on the venter. (4) Somewhat larger circular pores usually occur on the venter, in transverse series across the abdominal segments. These also are probably ceriferous glands. It will be noted that paired glands are characteristic of the dorsal and simple glands of the ventral areas respectively.

Male puparium of similar structure to that of the female, but smaller and proportionately narrower. The fringe is simpler, consisting only of the nymphal and larval elements. The winged adult emerges from beneath the posterior margin without the aid of any hinged operculum such as occurs in the allied genus *Lecaniodiaspis*.

Adult male with distinct neck. Antennæ ten-jointed, with three or four knobbed hairs at apex. Ocelli large, in two pairs—dorso-lateral and ventral respectively. Rudimentary eyes small, colourless and inconspicuous. Scutellum ample. Halteres absent or obscure. Genital sheath long and sharply pointed. Two long caudal filaments.

Larva of typical form. Antennæ distinctly six-jointed. A marginal series of (usually twenty-eight) paired glands. Posterior extremity with a pair of longish caudal setæ.

The species, so far as known, are all strictly oviparous.

Habitat: The species of this genus occur exposed on the leaves and bark of various plants. No gall-making or concealed forms are known, though some few species form depressions in the bark upon which they rest. As regards Ceylon, the genus is almost restricted to the *Bambusæ*. Of sixteen species recorded from the island, fourteen are found only upon plants of that group.

The preparation of specimens for microscopical examination is attended with some difficulty. The extreme delicacy of the derm, in all the species, necessitates very careful treatment. It is difficult to extract the insect from its covering, and—in practice—it will be found most convenient to boil the unruptured test in potash. The covering is rapidly dissolved by the alkali, leaving the insect free. A deep watch glass is better than a test tube for this process, and a comparatively short immersion in the boiling liquid is sufficient. Prolonged boiling renders the derm too soft and fragile. I have found that, to obtain the best results, the early adult females (before oviposition) should be selected. The body will then be fully extended and will display all the parts satisfactorily. In older specimens the abdomen is much contracted, and the relative position of the parts is confused. Staining is necessary for the proper demonstration of the structure. Fuchsin (acid) stains the glands and the more densely chitinous parts very clearly.

Although the various species of this genus are sufficiently well differentiated, it is not an easy matter to construct a clear synopsis. The disposition of the paired glands affords good characters for the main divisions: but, for some of the ultimate distinctions, I have been compelled to fall back upon the form of the female test—a not altogether satisfactory system.

Synopsis of Species.

A. With two enlarged paired glands near the posterior extremity.
- (*a*) With supplementary paired glands on dorsum.
  - (a^1) Dorsal paired glands in a double median longitudinal series.......... *exiguum*, p. 315.
  - (b^1) Dorsal paired glands in transverse series *rubrocoronatum*, p. 316.
- (*b*) Without supplementary paired glands on dorsum.
  - (a^1) Test of female approximately ten times longer than broad.......... *tenuissimum*, p. 318.
  - (b^1) Test of female about three times longer than broad.......... *udagamæ*, p. 319.

B. Without enlarged paired glands at posterior extremity.
- (*a*) With supplementary paired glands on dorsum.
  - (a^1) With dorsal paired glands in groups.
    - (a^2) Groups well defined; an inner marginal series of paired glands.......... *aureum*, p. 320.
    - (b^2) Groups ill defined; without inner marginal series.......... *flavociliatum*, p. 322.
  - (b^1) With dorsal paired glands at intervals on submarginal area; no caudal setæ .... *pudibundum*, p. 323.

(c^1) Dorsal paired glands irregularly disposed.
(a^2) Supplementary glands smaller than marginal series; no caudal setæ...... *ceriferum*, p. 324.
(b^2) Supplementary glands larges than those of marginal series.
(a^3) Dorsal glands very numerous and conspicuous; no caudal setæ...... *coronatum*, p. 327.
(b^3) Dorsal glands few and inconspicuous *bambusæ*, p. 328.
(c^2) Supplementary glands of same size as those of marginal area.
(a^3) Marginal series of glands single...... *tumidum*, p. 330.
(b^3) Marginal series of glands double ... *thespesiæ*, p. 331.
(b) Without supplementary paired glands on dorsum.
(a^1) Test of female with very long fringe......... *delicatum*, p. 332.
(b^1) Test of female with comparatively short fringe.
(a^2) Test abruptly narrowed and elevated behind, forming a caudal tube ....*solenophoroides*, p. 334.
(b^2) Test evenly tapering behind; not elevated.
(a^3) Test four or more times longer than broad .... *lineare*, p. 336.
(b^3) Test three times longer than broad... *longum*, p. 339.
(c^3) Test not more than twice as long as broad .... *miliaris*, p. 338.

ASTEROLECANIUM EXIGUUM, *sp. nov.*

(PLATE CXVIII. 6–11.)

Test of adult female (*figs.* 7, 8) fusiform, rather abruptly narrowed and produced behind; strongly convex above, the caudal extension depressed. Margin with a close fringe of short glassy filaments, terminating at the base of the caudal extension; a pair of longer and stouter filaments from the posterior extremity. There are probably some dorsal filaments (corresponding with the dorsal paired glands of the insect) on fresh examples; but these would be denuded very easily, and I can detect no trace of them in my examples. Colour bright yellow. Length 0·7 mm. Breadth 0·25 mm.

Male puparium (*fig.* 9) very elongate oval, slightly pointed behind; moderately convex above; indistinctly tricarinate on the posterior half. Marginal fringe longer and more conspicuous than on test of female; continuous. Colour pale yellow. Length 0·8 mm. Breadth 0·25 mm.

Adult female fusiform, tapering behind. Margin with a close series of small 8-shaped glands (*fig.* 11) which terminates at some distance from the posterior extremity; the ventro-marginal series of simple pores very minute and inconspicuous. Two loose longitudinal series of larger 8-shaped glands on the dorsum; and two similar but still larger paired glands (one on each side) near the posterior extremity which give rise to the long filaments at the extremity of the test. Three transverse series of simple circular pores across the abdominal area. Posterior extremity (*fig.* 10) with a pair of stout caudal setæ springing from small but distinctly prominent lobes, and, between them, a pair of smaller lobes each surmounted by a short spine; a similar spine near the base of each of the outer lobes. Anal ring at the base of a small chitinous tube; with six hairs which do not reach the margin. Length 0·6 mm. Breadth 0·25 mm.

Adult male unknown.

On under surface of leaves of bamboo (*fig.* 6). Yatiyantota. March.

Superficially somewhat resembling *A. solenophoroides;* but, structurally, abundantly distinct.

EXPLANATION OF PLATE CXVIII. 6–11.

ASTEROLECANIUM EXIGUUM.

Fig. 6. Insects on leaf of bamboo, nat. size.
7. Test of adult female, dorsal view, × 50.
8. „ „ lateral view, × 50.
9. Male puparium, dorsal view, × 50.
10. Abdominal extremity of adult female, optical section, × 450.
11. Marginal glands of adult female, × 450.

ASTEROLECANIUM RUBROCOMATUM, *sp. nov.*

(PLATE CXIX.)

Test of adult female (*fig.* 2) oval, rounded in front, the posterior extremity produced into a short blunt point. Moderately convex above. Colour pale greenish yellow; the fringe and some small groups of short filaments on the dorsum pinkish orange. The fringe long and rather irregular; the individual paired filaments rather coarse and only slightly divergent at their extremities; the several series confused and not easily distinguishable. The tufts of dorsal filaments are grouped into two approximately median longitudinal series. Length 1·50 to 2 mm. Breadth 0·8 to 1 mm.

Male puparium (*fig.* 3) smaller and proportionately narrower than that of the female; the abdominal area somewhat depressed; the fringe looser. Two dense scarlet dorsal tufts of long closely adherent filaments spring from the thorax and curl outwards to or beyond the margin, giving the insect a very distinct and characteristic appearance. Length 1·25 mm. Breadth 0·5 mm.

Adult female before oviposition (*fig.* 5) elongate, rounded in front, bluntly pointed behind. There are two pairs of short stout spines (*fig.* 8) on the venter: the first pair situated immediately anterior to the second pair of spiracles; the second pair near the base of the abdominal area. Posterior extremity (*fig.* 6) with the lobes well developed and subprominent; the anal ring hairless, at the base of a chitinous tube. Marginal glands (*fig.* 7) consisting of a close series of large 8-shaped pores, with an outer (ventral) crowded series of simple circular pores. A pair of larger 8-shaped pores, set transversely, close to the posterior extremity. Smaller supplementary paired pores on the dorsum arranged as follows:—One or two, at wide intervals, forming a submarginal series; about seven irregular transverse series upon the median area. Length of extended insect 1·50 mm. Breadth 0·6 mm.

The male of the second—or subnymphal—stage (*fig.* 4) is characterised by two dense curved clusters of 8-shaped glands on the dorsum of the thorax. These glands are concerned in the secretion of the scarlet processes on the back of the male puparium. There is only one pair of ventral spines, situated at the base of the abdomen. A close marginal series of large 8-shaped pores. Length 0·75 mm. Breadth 0·25 mm.

Adult male unknown.

On upper surface of leaves of *Bambusa* sp. Yatiyantota. March.

The male puparia are more numerous than the females, giving a distinct reddish appearance to the aggregations of insects, suggestive of one of the parasitic fungus diseases that affect Coccidæ.

EXPLANATION OF PLATE CXIX.

Asterolecanium rubrocomatum.

Fig. 1. Insects on leaf of bamboo, nat. size.
2. Test of adult female, dorsal view, × 16.
3. Male puparium, dorsal view, × 16.
4. Male subnymph, optical section, × 50.
5. Adult female, optical section, × 50.
6. Posterior extremity of female, × 450.
7. Marginal glands of female, × 450.
8. One of the ventral spines of adult female, × 450.

ASTEROLECANIUM TENUISSIMUM, *sp. nov.*

(Plate CXX. 1–4.)

Test of adult female (*fig.* 2), very long and narrow; front rounded; sides straight and parallel, except towards the posterior extremity, where they gradually taper to a blunt point; transversely convex above. Margin with a close continuous fringe of very short filaments; some longer filaments at the anterior extremity, and two longish stout filaments at the posterior extremity. Colour bright yellow to fulvous. Length 2 mm. Breadth 0·22 mm.

Adult female insect long and narrow. Rostrum approximately central. Rudimentary antennæ rather large and conspicuous; a pair of large 8-shaped glands between them (as seen in optical section). Margin with a close series of small 8-shaped glands (*fig.* 4) terminating at a short distance from the posterior extremity; the ventro-marginal series of simple pores in a single row. Abdominal extremity (*fig.* 3) with four small but prominent tubercles, the two outermost each bearing a longish stout seta, the two inner tubercles each with a short spine: a small spine below the base of each of the outer tubercles. A single large 8-shaped gland on each side, placed transversely, near the extremity. Anal ring at the base of a chitinous tube, with six rather short hairs. Two or more transverse series of simple circular pores across the abdomen. Length of extended insect 1 to 1·50 mm. Breadth 0·25 mm.

Male unknown in any stage.

On both surfaces of leaves of bamboo. Udagama and Yatiyantota.

EXPLANATION OF PLATE CXX. 1–4.

Asterolecanium tenuissimum.

Fig. 1. Female insects, on leaf of bamboo, nat. size.
2. Test of female, dorsal view, × 50.
3. Abdominal extremity of female (optical section), × 450.
4. Marginal glands of female, × 450.

ASTEROLECANIUM UDAGAMÆ, *sp. nov.*

(Plate CXX. 5–9.)

Test of adult female (*fig.* 5) elongate oval, slightly narrower behind; flattish, with a slight median longitudinal rounded ridge. Posterior extremity slightly upturned. Surface minutely rugose. Margin with a rather loose fringe of longish filaments. The presence of a pair of large 8-shaped glands near the abdominal extremity of the female insect (see *fig.* 9) suggests that, in fresh examples, there should be a corresponding pair of stout filaments projecting from the extremity of the test. Colour (of dried example) pale fulvous. Length 1·75 mm. Breadth 0·6 mm.

Adult female insect with rostrum approximately central. Rudimentary antennæ comparatively large, with two longish bristles on each (*fig.* 6). Stigmatic openings with conspicuous groups of small circular pores (*fig.* 7). Margin with a continuous fringe of 8-shaped glands and a single ventral series of small simple circular pores (*fig.* 8). Abdominal extremity (*fig.* 9) with four small but prominent tubercles bearing a pair of longish stout setæ and a pair of short spines on the outer and inner tubercles respectively. Anal ring at base of a chitinous tube; with six rather short hairs. A pair of unusually large 8-shaped glands (one on each side) near the extremity. Some simple circular pores, arranged more or less in transverse series, across the abdomen. (In the specimen under examination, the anal extremity is retracted and appears to lie within the margin.)

Male unknown in any stage.

On leaf of bamboo. Udagama. October. (Described from a single—somewhat imperfect—specimen.)

EXPLANATION OF PLATE CXX. 5–9.

Asterolecanium udagamæ.

Fig. 5. Test of female, dorsal view, × 25.
6. Antenna of female, × 450.
7. Stigmatic opening, × 450.
8. Marginal glands, × 450.
9. Abdominal extremity (optical section), × 450.

ASTEROLECANIUM AUREUM, *Boisduval.*

(Plate CXVIII. 1–5.)

Coccus aureus, Bdv., *Insectologie Agricole*, Vol. II. p. 301 (1868).

Asterolecanium aureum, Sign., *Ann. Soc. Ent. Fr.* (4), Vol. X. p. 277 (1870).

Asterolecanium greeni, Marchal, *Bul. Mus. d'Hist. Nat.*, Vol. VII. p. 448 (1904).

Test of adult female (*fig.* 1) very broadly oval; shortly pointed behind, the extremity with a small but conspicuous notch; with a median and two lateral longitudinal rounded ridges, the latter considerably curved. Greenish yellow at first, afterwards lemon-yellow; the fringe with a slightly reddish tint; dorsum with some tufts of short brownish red filaments, disposed in three series following more or less the lines of the ridges, the median series alternated with short colourless curved filaments. Younger examples sometimes with a median longitudinal reddish stripe. Fringe (*fig.* 2) very deep and close; composed of the usual three series; the outermost arranged in about twenty-eight more or less symmetrical bundles, with a pair of strongly divergent filaments in the interspace between each bundle; the second (nymphal) series less than half the length of the former, similarly divided into bundles the filaments of which are more widely spaced, the outer pairs of filaments of each bundle widely divergent, their ends meeting across the wider interspaces; the third (larval) series consisting of twenty-eight paired filaments curved in the form of crooks, alternating with the bundles of the outer series, the six hindermost united for their whole length and curved towards the posterior extremity, the remaining eight (on each side) with their filaments divergent from the base and curling in opposite directions; alternating with these curled filaments are twenty-eight short pairs which may be easily confused with the members of the nymphal series, but actually belong to the imaginal series, being secreted by a special set of widely spaced paired glands on the adult insect. Length 1·50 to 1·75 mm. Breadth 1·25 to 1·50 mm.

Adult female, before oviposition (*fig.* 3), broadly oval, slightly pointed behind. Posterior extremity (*fig.* 4) with the lobes moderately prominent, each bearing a longish stout seta; the small inner lobules each armed with a conspicuous spiniform hair; the usual third pair of spines on the intermediate margin apparently wanting. Anal ring with six stout hairs, scarcely projecting beyond the margin. Postanal chitinous bar narrow. A conspicuous chitinous paraphysis extending on each side from the base of the inner lobule almost to the anal ring. Clypeus comparatively short and broad. Rudimentary antennæ with three stout curved hairs. Spiracles occupying a position approximately half way between the margin and a median line. Marginal glands (*fig.* 5) consisting of a continuous series of large 8-shaped pores, within which, at regular intervals, is a set of twenty-eight similar paired pores (which give rise

to the straight paired filaments that alternate with the inner series of curved filaments on the test); a ventro-marginal series of small simple circular pores. Disc of dorsum with conspicuous groups of 8-shaped pores (*fig.* 3) corresponding with the tufts of short filaments on the disc of the test, viz., a median series, arranged more or less in short transverse lines; a curved lateral series of five rosette-shaped groups on each side, situated internally with regard to the position of the spiracles; a small rosette immediately behind the position of each antenna; and a rosette on each side immediately exterior to the position of the anterior spiracles. On the ventral surface of the abdomen there are four or five transverse series of simple circular pores, and an irregular series of similar (but smaller) pores connects each spiracle with the margin. Colour of living insect greenish yellow, changing after death to dark reddish brown. Length of extended insect 0·75 to 1 mm. Breadth 0·5 to 0·75 mm.

Male unknown.

On various orchids, *e.g.*, *Ophiopogon jaburan*, *Angroecum sesquipedale*, and *Cypripedium hamaldianum*, in plant-houses, Peradeniya; on *Calathea* and *Oncidium*, West Indies; on *Rheadia* and various plants in plant-houses in Europe.

A remarkably ornamental species; easily distinguishable from its allies by the separation of the fringe into symmetrical bundles of filaments.

EXPLANATION OF PLATE CXVIII. 1–5.

Asterolecanium aureum.

Fig. 1. Test of adult female, dorsal view, × 20.
2. Marginal fringe, × 100.
3. Adult female, optical section, × 60.
4. Posterior extremity of female, × 450.
5. Marginal glands, × 450.

ASTEROLECANIUM FLAVOCILIATUM, *sp. nov.*

PLATE CXXI. 1–5.

Female test (*figs.* 1 to 3) broadly oval. Strongly convex above; sides rather abrupt; apex somewhat flattened or depressed, with a median rounded ridge; a raised zone surmounting the steep sides. The whole test sometimes more or less completely flattened by pressure of the leaf-sheath beneath which it is concealed. Posterior extremity abruptly narrowed and elevated; in the form of a short tube. Colour of living examples olive green; dried examples ochreous. Fringe pinkish orange, contrasting strongly with the body of the test; in three series, the outermost longest, consisting of rather stout parallel filaments, their tips very slightly divergent; innermost series very short and inconspicuous, widely interrupted. There are usually traces of three longitudinal series of processes on the dorsum. Length 1 mm. Breadth 0·75 mm.

Adult female oval. Rudimentary antennæ at some distance from margin. Rostrum rather large. Marginal series of paired pores (*fig.* 4) comparatively large and conspicuous, with a crowded ventro-marginal series of simple circular pores. There are some supplementary paired pores on the dorsum, arranged in small groups at intervals; but the material is not in sufficiently good condition for the determination of their exact position. From the traces of a treble series of processes on the test, it is probable that the paired dorsal pores are correspondingly disposed. Posterior extremity (*fig.* 5) apparently without the usual anal lobes or setæ. The smaller inner tubercles and spines are well developed. Anal ring with six stout hairs. Dorsal lip of anal aperture very broad, the sides recurved.

Male unknown.

On small branches of *Arundinaria*, usually concealed beneath the leaf-sheaths. Pundaluoya.

EXPLANATION OF PLATE CXXI. 1–5.

ASTEROLECANIUM FLAVOCILIATUM.

Fig. 1. Branch of *Arundinaria*, with insects, nat. size.
2. Test of female, dorsal view, × 20.
3. „ „ lateral view, × 20.
4. Marginal glands of adult female, × 450.
5. Posterior extremity of female, × 450.

ASTEROLECANIUM PUDIBUNDUM, *sp. nov.*

(Plate CXXII. 6–10.)

Test of adult female (*fig.* 6) oblong oval, with a short conical projection at the posterior extremity. Smooth above, often flattened by compression with the covering leaf-sheath. Fringe usually imperfect; long, colourless, with occasional filaments springing from the submarginal area, continued almost to the tip of the conical projection. Length 1·5 to 1·75 mm. Breadth 1 to 1·15 mm.

Adult female insect, before oviposition, tapering to a blunt point at posterior extremity (*fig.* 8). After oviposition the anal segment is retracted (*fig.* 7). Abdominal extremity (*fig.* 9) without lobes or setæ. Anal aperture and ring small and inconspicuous, the latter hairless. There are two minute spines on each side of the anal opening, and one slightly larger spine on each side towards the base of the anal segment. Derm with scattered small circular pores. Margin (*fig.* 10) with a close series of 8-shaped glands, broken only for a short space at the posterior extremity; the ventro-marginal series of circular pores numerous. At intervals within the margin are one or two larger 8-shaped glands (*figs.* 7, 8, 10). Length of extended example 1·25 mm. Breadth 0·85 mm.

Male unknown in any stage.

On small branches of *Arundinaria*, concealed beneath the leaf-sheaths. Pundaluoya.

EXPLANATION OF PLATE CXXII. 6–10.

ASTEROLECANIUM PUDIBUNDUM.

Fig. 6. Test of adult female, dorsal view, × 25.
7. Posterior extremity of female, after oviposition, × 75.
8. " " before oviposition, × 75.
9. " " × 450.
10. Marginal and dorsal glands, × 450.

ASTEROLECANIUM CERIFERUM, *sp. nov.*

(PLATE CXXIII.)

Test of adult female (*figs.* 3, 4) elongate, narrow; lateral margins approximately parallel, extremities rounded. Dorsum moderately convex, the posterior third depressed and slightly concave; sides and front almost perpendicular, slightly sloping inwards, demarked from the dorsum by the angular marginal line; posterior extremity free, the under parts sloping sharply inwards so that, in profile (*fig.* 4), it appears to be sharply pointed. Ventral surface convex, owing to a marked depression in the leaf beneath the insect. Margin with straight stout glassy colourless filaments, rather widely spaced, longest at the two extremities. Sides thickly coated with opaque, white, mealy secretion, which extends slightly over the margin, concealing the bases of the glassy filaments. Colour, during life, pale lemon yellow, darkening afterwards to ochreous. Length 1·5 mm. Breadth 0·5 mm.

Male puparium (*fig.* 6) elongate, narrow; bluntly rounded in front, pointed behind; a more or less distinct rounded median longitudinal ridge; anterior half convex, posterior half depressed and concave. Colour very pale lemon yellow, the sides more or less coated with opaque white secretion. In fresh examples there is probably a fringe of glassy filaments, as in the female; but in all my examples the fringe has disappeared. Length 1·25 mm. Breadth 0·28 mm.

Adult female bright lemon yellow, darkening after death. Of approximately the same form as the female test; slightly narrowed towards the posterior extremity. Antennæ rather prominent; sub-globular, each with several curved hairs at its extremity. Spiracles large and conspicuous, each with a dense group of small circular glands guarding its aperture. Posterior extremity (*fig.* 10) without lobes or setæ; anal ring apparently hairless, at the base of a remarkable funnel-shaped chitinous tube. Marginal 8-shaped glands widely and irregularly spaced; varying in size, largest at the two extremities of the body (*figs.* 8 and 10), smallest on the median area (*fig.* 9), the difference in size corresponding with the difference in length of the marginal filaments of the test, their longer axis usually set at a considerable angle with respect to the marginal line. Smaller supplementary paired glands scattered over the dorsum, more especially towards the margins, where they might almost be regarded as a secondary marginal series. Simple circular pores very numerous, more densely clustered towards the margin of the body (*fig.* 9). Length of extended insect approximately 1 mm. Breadth 0·35 mm.

Adult male unknown.

Embryonic larva (*fig.* 7) with eleven 8-shaped glands on each side, set more or less transversely.

On leaves of a species of bamboo, the insects resting in shallow pits on the under surface of the leaf, these hollows appearing on the upper surface as raised

orange-coloured patches bearing ridge-like rows of hypertrophied cuticular cells (*fig.* 2). In jungle, above Bogawantalawa (6000 ft.).

The remarkable structure of the anal tube differentiates this species from most of its allies. Other noticeable characters are the dense deposit of white waxy secretion on the sides of the test, the diagonal direction of the paired marginal pores, and the unusual abundance of simple circular pores on the body of the insect.

EXPLANATION OF PLATE CXXIII.

ASTEROLECANIUM CERIFERUM.

Fig. 1. Leaf of bamboo, with insects *in situ*, nat. size.
2. Upper surface of leaf, showing ridges of hypertrophied cells above the position of the insect, × 20.
3. Test of adult female, dorsal view, × 23.
4. Test of female, side view, × 23.
5. „ „ „ var. *prominens*, × 23.
6. Male puparium, × 23.
7. Embryonic larva, × 250.
8. Marginal glands from front of adult female, × 450.
9. Marginal glands from median area, × 450.
10. Posterior extremity of adult female, × 450.

ASTEROLECANIUM CERIFERUM, *var.* PROMINENS.

(PLATE CXXIII. FIG. 5.)

Differs from the type principally in the form of the female test, which, seen in profile (*fig.* 5), slopes distinctly upwards to the posterior extremity. There is also a complete absence of the pitting of the leaf and of the hypertrophied cell structure on the opposite surface, the insects consequently standing up prominently from the surface of the leaf. Structure of adult female as in type : the marginal paired pores slightly larger and more distinct.

On under surface of foliage of small-leaved bamboo, *Oxytenanthera thwaitesii.* Newera Eliya (above 6000 ft.).

ASTEROLECANIUM CORONATUM, *sp. nov.*

(PLATE CXXIV.)

Test of adult female (*figs.* 2–4) very broadly oval, sometimes almost circular, with a short tubular upturned caudal extension (*fig.* 3). Strongly convex above, with two conspicuous foveæ on the dorsum, the depressed areas divided by a rounded ridge which is expanded and elevated behind; sides rising steeply from the margin, surmounted by a series of fourteen longish radiating pointed processes, which, in older and worn examples, are often incomplete or reduced to rounded prominences. Margin with a fringe of short glassy filaments, more or less concealed by a thick deposit of opaque white waxy matter. Colour fulvous, opaque and minutely granular in fresh examples, semi-translucent and smooth in worn examples; massed examples (*fig.* 1) with a distinctly pinkish tinge. Length 0·8 mm. Breadth 0·6 mm.

Male puparium (*fig.* 5) rounded in front, broadest at a point about one-third from anterior extremity, tapering evenly behind. Dorsum with two conspicuous foveæ extending to the posterior extremity, giving a tricarinate appearance to the insect. Colour pale stramineous. Length 0·5 mm. Breadth 0·3 mm.

Adult female (*fig.* 6) of the same form as the test: the body broadly oval, with a stout caudal extension. The whole dorsum with numerous small irregularly disposed 8-shaped glands, amongst which are a few of a much larger size (*fig.* 8), forming an irregular sub-lateral series. Margin with a close series of small 8-shaped glands and a ventro-marginal series of small, simple circular pores (*fig.* 9). Posterior extremity (*fig.* 7) without caudal setæ, but with two small marginal spines on each side. Anal ring with six stout hairs scarcely projecting beyond the margin. Dorsal lip of anal aperture broad, extending to hinder margin, the sides slightly recurved. From four to six small circular pores on each side, just within the margin. Length 0·7 mm. Breadth 0·5 mm.

Densely clustered at the base of the stems of the 'Giant Bamboos' (*Dendrocalamus giganteus* and *Gigantochloa aspera*). Peradeniya.

EXLANATION OF PLATE CXXIV.

ASTEROLECANIUM CORONATUM.

Fig. 1. Insects on stem of 'Giant Bamboo,' nat. size.
2. Test of adult female, dorsal view, × 36.
3. " " lateral view, × 36.
4. " " ventral view, × 36.
5. Male puparium, dorsal view, × 36.
6. Adult female, optical section, × 70.
7. Abdominal extremity of female, × 450.
8. Paired glands from dorsum of female, × 450.
9. Marginal glands of female, × 450.

ASTEROLECANIUM BAMBUSÆ, *Boisduval.*

(PLATE CXXV.)

Asterolecanium bambusæ, Bdv., *Insectologie Agricole* (1869); Signoret, *Ann. Soc. Ent. Fr.* (4), Vol. X. p. 280 (1870); Newstead, *Mon. Brit. Cocc.*, Vol. II. p. 151 (1903).

Test of adult female (*figs.* 1 *to* 6) oval, convex above, the posterior extremity slightly produced into a blunt point where is a small terminal aperture; smooth, glassy; colourless, or tinged with pale green or yellow; transparent, revealing the form of the insect and eggs beneath. Dried examples assume a more definite ochreous colour, a brown patch at anterior extremity representing the dead body of the insect. Marginal fringe pinkish, consisting of a double series of glassy tubular filaments springing from the margin in pairs, each pair contiguous at the base and for the greater part of the length, but diverging laterally at their free extremities which meet the ends of the adjacent filaments—thus forming a series of narrow loops irregularly crossed by fine web-like threads (*fig.* 9); the outermost series continuous, except at anal extremity, and longest; the second (nymphal) series less than half the length of the outer, and interrupted at more or less regular intervals; an innermost (larval) widely spaced series of crook-shaped filaments. Length (without fringe) 2 to 2·50 mm. Breadth 1·10 to 1·60 mm. Fringe, outer series 0·1 mm.; inner series 0·04 mm.

Adult female insect at first more or less filling the test (*fig.* 2). After the deposition of the eggs, the abdomen becomes shrunken and the insect occupies the anterior part of the test only, the remaining cavity being packed with ova. Colour of insect dull green, the dorsum more or less mottled with reddish brown. Dried insect uniform reddish brown. Rostrum conspicuous, pyriform, approximately central (*fig.* 15). Antennæ submarginal, rudimentary, consisting of an irregular tubercle surmounted by two longish stout bristles and one short spiniform hair (*fig.* 18). Spiracles conspicuous, subglobular, at a considerable distance from margin, with scattered series of minute pores connecting them with the margin. Abdominal extremity (*fig.* 16) slightly cleft; anal tubercles broad and stout, but not very prominent, each with a long stout seta at its apex and one or two short stout spines near the base. Anal ring stout, with six stout hairs which just project beyond the margin. Margin with a continuous series of large approximately circular thick-rimmed pores, in pairs, and a double ventro-marginal series of minute circular pores (*fig.* 17). There are some scattered paired pores of a slightly larger size on the dorsum, and many simple circular pores on the ventral surface of the abdomen. Length of extended insect 1·25 to 1·75 mm. Breadth 0·80 to 1·25 mm. After oviposition the insect becomes greatly shrunken and does not resume its original proportions during maceration.

Early adult female at first pinkish (*fig.* 10), later dull green (*fig.* 7), finely maculated with reddish brown. . The outermost series of the fringe is at first

the shorter, but soon outgrows the nymphal fringe. Traces of the larval fringe can often be distinguished at intervals within the margin (*fig.* 11).

In the nymphal stage the fringe is in a single series, but within the margin are remains of the divaricating filaments of the later larval stage.

The newly hatched larva (*fig.* 12) is of an oblong oval form, very pale pinkish or reddish brown. Limbs well developed. Antennæ six-jointed, the sixth much the longest, with truncate apex. Margin with fourteen 8-shaped spinnerets on each side, and a median dorsal pair of similar pores immediately above the rostrum. Length 0·2 mm.

The larva subsequently secretes a fringe of short curling glassy filaments (*fig.* 13), which are paired and diverging on the cephalo-thoracic area, but single on the abdominal margin (although the spinnerets giving rise to these latter are of the same form as the others).

Ova very pale pinkish or yellowish.

Male unknown. A single example was observed, in which the dorsum was distinctly tricarinate and bore a marginal and three dorsal series of curling filaments (*fig.* 14). This may possibly be the male puparium.

Habitat: clustered on the stems of various species of bamboo, more particularly upon *Dendrocalamus giganteus*, *Gigantochloa aspera*, and *Bambusa vulgaris;* sometimes occurring singly under the leaf sheaths of the last. Newstead records this species as occurring on the leaves of bamboo in the Royal Botanic Gardens, Kew; but in Ceylon the insect appears to be confined to the stems of the plant.

Recorded also from India, Algeria, Brazil, W. Indies, and Mauritius. May be expected to occur throughout the tropics, wherever the larger kinds of bamboo are grown.

EXPLANATION OF PLATE CXXV.

ASTEROLECANIUM BAMBUSÆ.

Fig. 1. Section of bamboo stem, with insects, nat. size.
2. Adult female, before deposition of eggs, ventral view, × 20.
3. „ older example, dorsal view, × 20.
4. „ after deposition of eggs, dorsal view, × 20.
5. „ „ „ ventral view, × 20.
6. „ „ „ side view, × 20.
7. Early adult female, dorsal view, × 20.
8. „ „ side view, × 20.
9. Fringe of adult female, × 150.
10. Early adult female, shortly after ecdysis, × 15.
11. Fringe of early adult female, × 250.
12. Newly hatched larva, × 75.
13. Older larva, dorsal view, × 35.
14. ? male puparium, dorsal view, × 25.
15. Adult female, after maceration, ventral view, × 70.
16. Abdominal extremity of adult female, × 450.
17. Marginal glands of adult female, × 450.
18. Antenna of adult female, × 450.

ASTEROLECANIUM TUMIDUM, *sp. nov.*

(Plate CXXI. 6–10.)

Test of adult female (*figs.* 6, 7) oval in outline, with a slightly expanded flattened process at the posterior extremity projecting below the anal tube, which is sharply upturned and has a transverse slit-like opening. Median dorsal area strongly domed; marginal area somewhat flattened. Margin with a continuous fringe composed of three distinct series of filaments (*fig.* 8), the innermost (larval) series consisting of single or double crook-shaped filaments widely separated from each other. Dorsum with many small irregular prominences, probably the remains of a series of dorsal filaments indicated by many 8-shaped glands on the dorsum of the insect itself. Length 0·75 mm. Breadth 0·45 mm. Depth 0·25 mm.

Adult female oval. Abdominal extremity (*fig.* 9) with the small anal lobes slightly prominent, each bearing a stout seta; an inner pair of smaller lobes, each with a single sharply pointed spine. Dorsal lip of anal aperture set back and bearing a pair of small mucronate tubercles. Anal ring with six short hairs. Margin of body with a close series of small 8-shaped glands (*fig.* 10); the ventro-marginal pores wanting or inconspicuous. Median area of dorsum with numerous similar 8-shaped glands, massed more particularly towards the base of the abdomen. Length approximately 0·5 mm.

Male unknown.

On leaves of bamboo. Udagama. October.

EXPLANATION OF PLATE CXXI. 6–10.

Asterolecanium tumidum.

Fig. 6. Test of adult female, dorsal view, × 50.
7. „ „ side view, × 50.
8. Part of marginal fringe, × 200.
9. Abdominal extremity of adult female, × 450.
10. Marginal glands, × 450.

ASTEROLECANIUM THESPESIÆ, *sp. nov.*

(Plate CXXII. 1–5.)

Test of adult female (*fig.* 2) subcircular: posterior extremity very slightly produced and broadly notched; both dorsal and ventral surfaces moderately convex. Dorsum obscurely tricarinate, the carinæ broadly rounded. Surface of dorsum weakly transversely ribbed, the irregularities usually masked by a scurfy or tomentose layer composed of broken and matted dorsal filaments. Margin with a fringe of moderately long glassy filaments which are usually very irregular and matted together. The imperfect condition of the fringe makes it difficult to determine its exact arrangement or to account for the double row of marginal glands found on the body of the insect. Colour greenish yellow. Diameter 1·50 to 1·75 mm.

Male puparium (*fig.* 3) ovoid, slightly narrowed behind; flattish; obscurely tricarinate. Margin usually with indications of a fringe, but often quite naked. Length 1 mm. Breadth 0·75 mm.

Adult female insect subcircular or broadly oval. Rostrum approximately central. Abdominal extremity (*fig.* 4) with the anal lobes well developed and prominent, each bearing a long stout setæ. Between the anal lobes are four prominent rounded lobules, each with a longish spine. There are two slightly smaller spines at the base of each anal lobe—one on each side. Chitinous lip of anal aperture dense and conspicuous. Anal ring with six longish stout hairs. Marginal series of 8-shaped glands double (*fig.* 5), except close to abdominal extremity, where it becomes single; ventro-marginal simple pores well defined. Dorsum thickly strewn with 8-shaped glands of same size as those of the marginal series. Diameter 1 to 1·5 mm.

Adult male unknown.

On small branches of *Thespesia populnea*. Jaffna. March. The insects occupy small depressions in the bark (*fig.* 1). Superficially resembling *A. variolosum* and *A. pustulans*, but readily distinguishable by the regular double series of marginal glands. From *A. ventruosa*, which has a double marginal series of paired glands, the present species may be distinguished by the presence of numerous similar glands on the disc of the dorsum.

EXPLANATION OF PLATE CXXII. 1–5.

Asterolecanium thespesiæ.

Fig. 1. Insects on branch of *Thespesia*, nat. size.
2. Test of adult female, dorsal view, × 25.
3. Male puparium, dorsal view, × 25.
4. Abdominal extremity of adult female, optical section, × 450.
5. Marginal glands, × 450.

ASTEROLECANIUM DELICATUM, *Green.*

(PLATE CXXVI.)

Planchonia delicata, Green, *Ind. Mus. Notes*, Vol. IV. No. 1, p 5 (1896).
Asterolecanium delicatum, Cockerell, *Check List*, p. 328 (1896).

Test of adult female (*fig.* 4) flattish above, or very slightly convex; oblong oval, more or less pointed behind; transparent; glassy; very pale yellow. Marginal fringe (*fig.* 5) very long, glassy, pale yellow; consisting of an outer continuous series of long filaments; an inner series of shorter filaments, interrupted at regular intervals; and an intramarginal series of twenty-eight short paired curling filaments, the anterior eight pairs—on each side—divergent. Length (exclusive of fringe) 1·50 to 2·25 mm. Breadth 0·75 to 1·10 mm. Outer filaments of fringe approximately 0·15 mm. long.

Adult female insect oblong oval; greatly contracted after deposition of eggs. Bright yellow or greenish yellow in life; tinged with reddish brown after death. Antenna consisting of a small tubercle surmounted by two or three stout bristles. Abdominal extremity (*fig.* 17) typical of the genus; similar to that of *A. bambusæ*. Marginal spinnerets (*fig.* 18) slightly larger than those of *bambusæ:* apparently unaccompanied by simple pores. No paired spinnerets on disc of dorsum. Some simple circular spinnerets on venter of abdomen. Length 1·25 to 1·75 mm. Breadth 0·75 to 1 mm.

Male puparium (*fig.* 2) oblong oval; flattish; colourless or very pale yellow, the reddish pupa plainly visible beneath the test. A single marginal fringe of long paired filaments, and a scattered intramarginal series of short divaricating curling paired filaments (*fig.* 9). Length 1·25 mm. Breadth 0·75 mm.

Adult male (*figs.* 3 and 10) reddish yellow; apodema castaneous; notal plates outlined with castaneous. Rather broad and depressed. Antennæ (*fig.* 14) with first two joints short and stout, others narrow and elongated; three knobbed hairs at apex of terminal (tenth) joint; all the joints with numerous short bristles, and six very long whip-like hairs distributed as follows:—two on eighth, and one on each of the fifth, seventh, ninth, and tenth joints. Head (*fig.* 11) broad; laterally tumescent. Ocelli four, the upper pair on anterior margin, the lower pair close together on under surface of head. Scutellum large, longer than broad. Genital sheath (*fig.* 13) long and pointed. Wings ample. Length (including genital sheath) 1·10 mm.

Newly hatched larva (*fig.* 15) pale green. Eyes marginal, colourless, and indistinct. Antennæ (*fig.* 16) six-jointed; terminal joint with one long knobbed hair and three shorter simple hairs. Margin with twenty-eight 8-shaped spinnerets.

Later larva (*fig.* 7) with a marginal series of twenty-eight pairs of strongly curling glassy filaments (*fig.* 8), the anterior sixteen divergent.

In small groups on under surface of leaves of *Arundinaria* sp. Pundaluoya. Recorded also from Japan.

Distinguishable from *bambusæ* by the much longer fringe and flatter test.

EXPLANATION OF PLATE CXXVI.

ASTEROLECANIUM DELICATUM.

Fig. 1. Bamboo leaf, with insects *in situ*, nat size.
2. Male puparium, dorsal view, × 20.
3. Adult male, × 20.
4. Adult female in test, dorsal view, × 25.
5. Fringe of female test, × 135.
6. Abdominal extremity of adult female, after oviposition, × 120.
7. Half-grown larva, dorsal view, × 50.
8. Larval fringe, × 100.
9. Fringe of male puparium, × 135.
10. Adult male, dorsal view, × 50.
11. Head of adult male, from below, × 50.
12. Leg of adult male, × 135.
13. Genital sheath of male, ventral view, × 135.
14. Antenna of male, × 135.
15. Newly hatched larva, × 20.
16. Antenna of larva, × 50.
17. Abdominal extremity of adult female, × 450.
18. Marginal spinnerets of female, from thorax, × 420.

ASTEROLECANIUM SOLENOPHOROIDES, *Green.*

(PLATE CXXVII.)

Planchonia solenophoroides, Green, *Ind. Mus. Notes*, Vol. IV. No. 1, p. 6, 1896.

Asterolecanium solenophoroides, Cockerell, *Check List*, p. 328, 1896.

Test of adult female (*figs.* 9–13) colourless during life of insect, afterwards pale yellow; hard and glassy; pyriform, the hinder third abruptly narrowed and elevated (*fig.* 10), forming a tube through which the larvæ make their escape. Dorsum very strongly convex above; margins flattened. In fresh examples there are three longitudinal series of erect, paired, curling, glassy filaments along the middle of the dorsum (*figs.* 10, 12), but these are very brittle and easily detached. A continuous submarginal fringe of comparatively short, paired divergent filaments (absent on the elevated caudal process), and a scattered intramarginal series of shorter paired filaments. These two series are probably representative of the nymphal and larval stages respectively. The absence of the usual third (outermost) series of the fringe is peculiar, as the adult insect bears the normal marginal series of 8-shaped spinnerets. Length 0·75 mm. Breadth 0·45 mm.

Male puparium (*figs.* 16, 17) long and narrow, broadest in front; dorsum with three rows of long glassy filaments; a continuous marginal series of short divergent filaments, and the usual interrupted intramarginal series. Colour at first green, afterwards pale yellow. Length 1 mm. Breadth 0·25 mm.

Adult female greenish yellow; at first of same form as the test (*figs.* 15, 18); after oviposition, the caudal extension is completely retracted (*fig.* 13). Spiracles submarginal. Anal ring (*fig.* 19) with six stout hairs; the chitinous dorsal lip interrupted in the middle. Marginal 8-shaped spinnerets (*fig.* 20) very small, extending only to base of caudal process. In spite of the presence of dorsal filaments on the test, no corresponding glands are distinguishable on the dorsum of the insect. These dorsal filaments originate—probably—in the nymphal stage. Length of extended insect 0·70 mm. Breadth 0·40 mm.

Adult male (*figs.* 1, 2) pale yellow; apodema pale reddish; ocelli black. Scutellum very large. Head broad behind; lower pair of ocelli surrounded by short curved bristles (*fig.* 5). Antennæ (*fig.* 3) shorter than body; three knobbed hairs on apex of tenth joint (*fig.* 4); all the joints clothed with shortish stout curved hairs. Foot (*fig.* 6) with one ungual and two tarsal knobbed digitules. Wings comparatively narrow. Length 0·5 mm.

Young larva (*fig.* 15) pale green. Antenna with a long knobbed hair at apex. Foot with four knobbed digitules.

Male and female puparia singly or in small groups on under surface of leaves of *Arundinaria* sp. Pundaluoya.

The specific name was suggested by the resemblance of the structure of the female test to that of Maskell's genus *Solenophora*, which (owing to the pre-occupation of the earlier name) was subsequently altered to *Solenococcus*, which —in its turn—is probably referable to Comstock's older genus, *Cerococcus*.

EXPLANATION OF PLATE CXXVII.

Asterolecanium solenophoroides.

Fig. 1. Adult male, dorsal view, × 60.
2. „ „ lateral view, × 60.
3. Antenna of male, × 175.
4. Terminal joint of antenna, × 350.
5. Head of male, under side, × 60.
6. Leg of male, × 300.
7. Genital sheath and penis, × 250.
8. Leaf of *Arundinaria*, with insects *in situ*, nat. size.
9. Adult female, dorsal view, before oviposition, × 40.
10. „ „ lateral view, × 40.
11. „ „ ventral view, × 40.
12. „ „ front view, × 40.
13. „ „ dorsal view, after oviposition, × 40.
14. Fringe of adult female, × 300.
15. Young laıva, ventral view, × 75.
16. Male puparium, dorsal view, × 40.
17. „ „ with dorsal filaments intact, × 40.
18. Adult female insect, before gestation, × 70.
19. Abdominal extremity of female, × 450.
20. Marginal glands of female, × 450.

ASTEROLECANIUM LINEARE, *sp. nov.*

(Plate CXXVIII.)

Planchonia miliaris, var. *longa* (part), Green, *Ind. Mus. Notes*, Vol. IV. p. 5 (1896).

Test of adult female (*figs.* 2, 3) lanceolate, narrow, tapering at both ends, the hinder extremity produced into a tube-like passage for the exit of the larvæ. Convex above, the median dorsal area depressed and enclosing a more or less nodular median ridge. The posterior extremity with a small notch (*fig.* 3), which is afterwards enlarged by the passage of the larvæ (*fig.* 2). Marginal fringe incomplete or obscured by secretionary matter. There are usually a few longish paired diverging filaments at the anterior extremity, and some shorter ones at intervals along the margin, the remains—probably—of the continuous series present in the nymphal stage (*fig.* 9). Colour, during life, yellowish green; afterwards, pale ochreous yellow. Length 1 to 1·5 mm. Breadth 0·3 to 0·4 mm.

Adult female at first more or less filling the test (*fig.* 3), afterwards occupying only the anterior half (*fig.* 2). Colour, pale green or greenish yellow. Rostrum comparatively large and conspicuous. Rudimentary antennæ submarginal, close to anterior extremity. Abdominal extremity (*fig.* 4) normal; the setæ stout and usually crossed at the tips. Anal ring with six stout hairs. Marginal 8-shaped spinnerets, very obscure and faintly defined, so much so that they may be easily overlooked, and are, under the best conditions, extremely difficult to locate. In successful preparations, and with very careful adjustment of the light, a few of these paired pores can be distinguished, but I have been unable to determine whether there is a continuous marginal series or not. Length of extended insect (before oviposition) 1·1 mm. Greatest breadth, about 0·25 mm. Older examples average 0·5 by 0·3 mm.

Male puparium (*figs.* 10, 11) irregularly elliptical; broadest across abdominal area; bluntly pointed behind. Median dorsal area with depression and longitudinal nodulose ridge. Fringe more or less obscured—as in test of female—but showing traces of marginal and submarginal series of paired divergent hook-shaped filaments (*fig* 12). Length 0·9 mm. Breadth 0·35 mm.

Adult male (*figs.* 5 and 17) bright yellow; apodema and anterior margin of mesonotum reddish. Ocelli black; the lower pair largest, central, contiguous; the upper pair situated laterally, immediately behind base of antennæ. Terminal joint of antenna (*fig.* 8) with three long knobbed hairs. Foot (*fig.* 7) with four knobbed digitules. Genital sheath (*fig.* 6) broadly expanded at base, the lateral margin with a series of strong curved bristles. Length (including genital sheath) 0·6 mm.

Female nymph (*fig.* 9) lanceolate, flattish; pale green, with brownish maculations. A series of paired, divergent, curling filaments on the margin, those on the anterior extremity longer and straight.

Young larva (*fig.* 13) pale green. Eyes marginal, yellowish, inconspicuous, Antenna (*fig.* 14) six-jointed, the third longest. Apex with one long knobbed hair, a rather shorter simple hair, and several short bristles. Foot with four knobbed digitules.

Later larva (*fig.* 15) with a marginal series of twenty-eight paired curling filaments, the anterior eight on each side divergent, the remainder coincident (*fig.* 16).

On leaves of *Arundinaria* sp. Pundaluoya. Lying in rows along the parallel ribs of the leaf. The under surface of the leaf is preferred ; but, where the insects are in great abundance, the upper surface of the foliage is equally affected. Infested leaves are readily noticeable by a yellow discoloration.

Differs from *A. miliaris* by the proportionately narrower and more elongate tests of the female, by the simpler and more obscure fringe, and by the paucity and obscureness of the marginal 8-shaped spinnerets.

EXPLANATION OF PLATE CXXVIII.

ASTEROLECANIUM LINEARE.

Fig. 1. Leaf of *Arundinaria*, with insects, nat. size.
2. Test of adult female, after oviposition, × 50.
3. " " before oviposition, × 50.
4. Abdominal extremity of adult female, × 450.
5. Adult male, side view, × 65.
6. Genital sheath of male, × 250.
7. Leg of male, × 250.
8. Antenna of male, × 250.
9. Female nymph, dorsal view, × 50.
10. Puparium of male, ventral view, × 35.
11. " " dorsal view, × 35.
12. Fringe of male puparium, × 250.
13. Young larva, dorsal view, × 250.
14. Antenna of young larva, × 500.
15. Older larva, dorsal view, × 100.
16. Larval fringe, × 450.
17. Adult male, dorsal view, × 65.

ASTEROLECANIUM MILIARIS, *Boisduval.*

(PLATE CXXIX. 1–4.)

Asterolecanium miliaris, Bdv., *Insectol. Agricole* (1869); Sign., *Ann. Soc. Ent. Fr.* (4), Vol. X. p. 281 (1870).

Female test (*fig.* 2) oval, bluntly pointed behind, moderately convex above; central area slightly depressed, with a median longitudinal rounded carina. Colour of dried examples ochreous yellow. Fringe conspicuous; continuous; of a distinctly reddish or orange tint; apparently in three series (referable to the larval, nymphal, and imaginal stages respectively), the innermost series inconspicuous and widely interrupted. Length 1 to 1·15 mm. Breadth 0·5 mm.

Adult female at first almost filling the test, afterwards occupying only the anterior half (*fig.* 2). Posterior extremity (*fig.* 3) normal; the caudal setæ stout, usually crossed; spines on and between the abdominal lobes comparatively large and stout; anal ring with six stout hairs. Marginal series of paired pores (*fig.* 4) well defined; the pores small and close together, the intervals between adjacent pairs little greater than the space between the two halves of each pair. A ventro-marginal series of smaller simple circular pores. Rudimentary antennæ submarginal. Length of extended insect 0·75 mm.

Male unknown.

On stems and branches of 'Male Bamboo' (*Bambusa* sp.). Peradeniya.

Recorded also from Mauritius, Brazil, Jamaica, and Trinidad.

I have not had access to Boisduval's original diagnosis of the species, but my specimens agree sufficiently closely with the description given by Signoret, and with examples from Algiers submitted to me by Dr. P. Marchal, of Paris. In the latter, however, the paired pores are somewhat larger and more distant than in my examples from Ceylon.

EXPLANATION OF PLATE CXXIX. 1 4.

ASTEROLECANIUM MILIARIS.

Fig. 1. Female insects on branches of bamboo, nat. size.
2. Female test, dorsal view, × 40.
3. Posterior extremity of adult female, × 450.
4. Marginal glands of adult female, × 450.

ASTEROLECANIUM MILIARIS, *var.* LONGUM, *Green.*

(PLATE CXXIX. 5–8.)

Planchonia miliaris, v. *longa* (part), Green, *Ind. Mus. Notes*, Vol. IV. p. 5 (1896).

Asterolecanium miliaris, v. *longum*, Ckll., *Check List*, p. 328 (1896).

Test of adult female (*fig.* 6) differing from that of type in its narrower and more elongate form. Fringe longer on anterior margin; usually very imperfect. Length 1·25 to 1·50 mm. Breadth 0·45 to 0·48.

Adult female as in type. Marginal pores (*fig.* 8) more distinctly separated; ventro-marginal series of simple pores wanting or inconspicuous.

Abundant on both surfaces of leaves of *Bambusa oliveriana.* Peradeniya. December. Examples on upper surface of the leaves frequently destroyed by an orange-coloured fungus.

While the typical form of the species frequents, principally, the stems and branches of the plant, the variety *longum* appears to be confined to the foliage. This form was at first confused with the still more elongate insect found on leaves of *Arundinaria*, which I now believe to be specifically distinct and have described under the name of *lineare. A. miliaris* and its variety (*longum*) occur in the plains and up to 1700 feet. *A. lineare* is a mountain species, occurring only at altitudes of over 4000 feet.

EXPLANATION OF PLATE CXXIX. 5–8.

ASTEROLECANIUM MILIARIS, *v.* LONGUM.

Fig. 5. Insects on leaf of bamboo, nat. size.
6. Female test, dorsal view, × 40.
7. Posterior extremity of adult female, × 450.
8. Marginal glands of adult female, × 450.

POLLINIA, *Targioni-Tozzetti.*

Pollinia, Targ., *Bull. Soc. Ent. Ital.*, Vol. I. p. 263 (1869); Sign., *Ann. Soc. Ent. Fr.* (5), Vol. X. p. 274 (1870).

Adult female enclosed in a waxy or horny test differing from that of *Asterolecanium* in the absence of a marginal fringe of glassy filaments. In Signoret's diagnosis of the genus, the test is described as irregular, but this cannot be considered as a good generic character, being founded only upon a knowledge of a single species (*pollini*, s. *costæ*). Cockerell has described *Pollinia ovoides*, with a rough irregular test; but that insect is very doubtfully congeneric with *pollini*, having characters much more closely related to *Cerococcus*.

The adult female insect of typical *Pollinia* is distinguished from that of *Asterolecanium* by the absence of a marginal series of paired (8-shaped) glands. It has numerous paired glands on the disc of the dorsum; but this, again, is not essentially a generic character. In the genus *Asterolecanium*, we find certain species, with dorsal paired glands, and others in which they are totally absent. The characters of the anal segment are closely similar to those of *Asterolecanium*, consisting of a pair of minute anal lobes or tubercles, each bearing a stout seta and a simple anal aperture. The antennæ are rudimentary, and the limbs absent. There are no stigmatic spines, or cribriform plates.

The larvæ of *pollini* have marginal and dorsal series of 8-shaped glands, and there is a triangular median plate between the small anal lobes—on the dorsal aspect.

The larva of the single Ceylon species that I have included in this genus has not been observed.

The adult Ceylon insect differs from the type in being enclosed in a symmetrically circular translucent test, differing only from that of *Asterolecanium* in the absence of a marginal fringe. The insect itself is devoid of paired dermal glands. In other characters it conforms sufficiently well with the original diagnosis of the genus.

POLLINIA CEYLONICA, *sp. nov.*

(PLATE CXXX.)

Test of adult female (*figs.* 2, 3) circular, approximately hemispherical; with a short rounded upturned tube at posterior extremity, opening transversely just in front of the apex. No marginal fringe. Some remnants of a few crook-shaped filaments on the dorsum. Colour bright golden yellow. Diameter 1·12 to 1·25 mm.

Male puparium (*fig.* 12) oblong, rounded at the two extremities. A scarcely perceptible median ridge. No fringe. Length 1 mm. Breadth 0·45 mm.

Adult female circular. Derm of both surfaces with scattered circular spinnerets of several sizes. Abdominal segments with transverse series of circular spinnerets. Several (usually eight) clusters of from three to eleven larger circular thick-rimmed pores on dorsum (*fig.* 6), in two longitudinal series. No marginal series of glands, and no 8-shaped spinnerets. Abdominal extremity (*fig.* 5) with two longish stout setæ arising from small densely chitinous tubercles, and many minute spines with expanded circular bases. Anal tube densely chitinous; anal ring apparently hairless. Diameter 0·75 to 0·9 mm.

Other stages unknown.

On under surface of leaves of undetermined tree in dense jungle. Ramboda.

EXPLANATION OF PLATE CXXX.

POLLINIA CEYLONICA.

Fig. 1. Female insect on leaf, nat. size.
2. Test of adult female, dorsal view, × 25.
3. Test of female, lateral view, × 25.
4. Male puparium, dorsal view, × 25.
5. Abdominal extremity of female, optical section, × 450.
6. One of the dorsal groups of glands, × 450.

AMORPHOCOCCUS, *Green.*

Amorphococcus, Green, *Ent. Mo. Mag.*, Vol. XXXVIII. p. 261 (1902).

Insects enclosed in galls. Adult female forming no test; naked or partially enveloped in the nymphal pellicle. Antennæ rudimentary. Limbs wanting. Mentum monomerous. Without stigmatic spines. Derm without cribriform plates or paired glands. Anal lobes minute or obsolescent. Anal ring setiferous.

Larva with conspicuous 8-shaped glands giving rise to curling glassy filaments.

The characters of the larva clearly indicate the relationship of this abnormal genus to *Asterolecanium.*

Probably allied to Maskell's genus *Frenchia.*

AMORPHOCOCCUS MESUÆ, *Green.*

(PLATE CXXXI.)

Amorphococcus mesuæ, Green, *Ent. Mo. Mag.*, Vol. XXXVIII. p. 261 (1902).

Insects occupying rounded or conical ligneous galls on the slender branches of the tree (*fig.* 1). There is a minute aperture at the apex of the gall, leading into a sharply conical chamber (*figs.* 2, 3) at the base of which the insect rests—either naked (*fig.* 2) or enveloped in the nymphal pellicle (*fig.* 3). In the latter case, the pellicle forms a lining to the cavity. The floor of the cavity, after removal of the insect, shows a white X-shaped mark—due to waxy secretion deposited from the stigmatic areas. An isolated gall measures 4 to 5 mm., long diameter.

Female insect bright yellow; soft and fleshy; irregularly globular, with indentations at the stigmatic areas (*fig.* 4); dorsum slightly concave; venter and sides strongly rounded; anal segment narrowed, flattened, tapering, directed upwards towards the aperture of the gall (*fig.* 2). Antenna consisting of a minute tubercle, with a few stout bristles at its apex. Limbs completely wanting. Spiracles well developed, the stigmatic areas with straggling groups of parastigmatic glands. Anal segment (*fig.* 5) slightly notched at extremity; the anal tube somewhat densely chitinous on the dorsal aspect; a pair of very stout short setæ lying transversely across the aperture; anal ring with eight hairs; a series of small hair-like spines on the submarginal area. Derm very thin and delicate, with a few minute simple circular glands. Diameter approximately 1·25 mm.

Nymphal female pale yellow; slightly larger than the adult insect. Form conical, with rounded base; the apex of the cone occupied by the anal segment; other characters similar to those of adult. After the final ecdysis, the nymphal pellicle encloses the adult insect and the ova. Diameter 1·5 mm.

Male unknown in any stage.

Embryonic larva (*fig.* 7) with well-developed antennæ and limbs. A marginal series of twenty-eight 8-shaped glands, and two subdorsal series of ten each. The larvæ wander on to the younger twigs of the tree, where the bark is still smooth and soft. After attachment, they become gradually imbedded by a hypertrophied growth of the surrounding cortical cells.

The later larva (*fig.* 6) develops a marginal series of paired crook-shaped filaments, of which those springing from the thoracic margin are widely divergent. Two pairs of strongly curling filaments spring from each side of the dorsum, on the thorax.

On the terminal twigs of the 'ironwood' tree (*Mesua ferrea*). Peradeniya.

Where two or three of the insects have established themselves close

together the resulting galls become confluent, but each individual occupies a distinct cavity.

The full development of the galls appears to be independent of the continued presence of the insect. In the cavities of many fully-formed galls only dead larvæ may be found. Galls from which the original occupants have disappeared are often occupied by a Diaspid (*Aspidiotus cuculus*) peculiar to this location : as many as five or six of the intruders may be packed into a single cavity. Other deserted galls are occupied by colonies of a small Thrips.

Hymenopterous parasites, bred from these galls, have been named by Ashmead, *Eupelmus amorphococci*

EXPLANATION OF PLATE CXXXI.

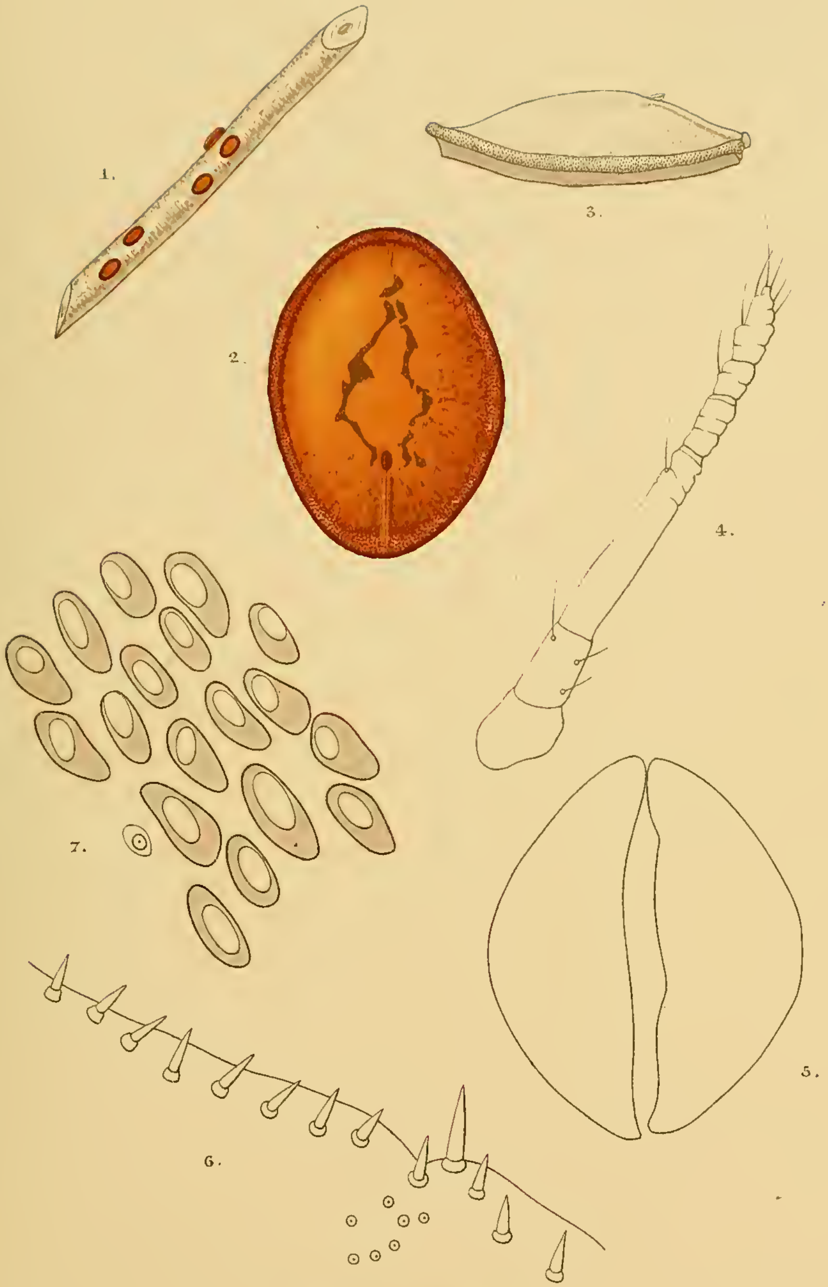
Amorphococcus mesuæ.

Fig. 1. Branch of *Mesua ferrea*, with galls, nat. size.
2. Section of gall, with adult female, *in situ*, × 8.
3. „ with adult enveloped in nymphal skin, × 8.
4. Adult female, ventral view, × 20.
5. Anal segment of female, × 450.
6. Full-grown larva, dorsal view, × 50.
7. Embryonic larva, optical section, × 250.

EXPLANATION OF PLATE XCIV.

NEOLECANIUM CRUSTULIFORME.

Fig. 1. Adult insects, *in situ*, nat. size.
2. Adult female, dorsal view, × 15.
3. " " side view, × 15.
4. Antenna, × 250.
5. Anal operculum, × 250.
6. Marginal fringe and stigmatic area, from below, × 450.
7. Dermal cells, × 250.



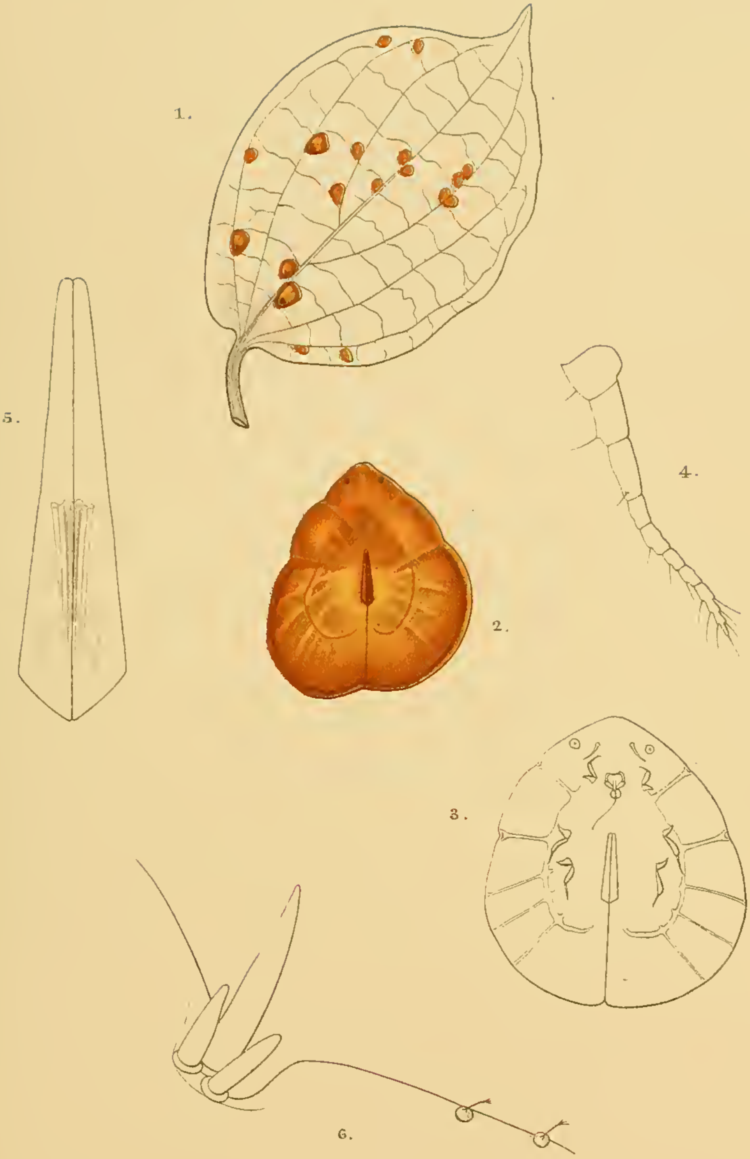
E.E.Green del. P.W.M.T.impr. J.F.S.lith.

NEOLECANIUM CRUSTULIFORME.

EXPLANATION OF PLATE XCV.

PROTOPULVINARIA LONGIVALVATA.

Fig. 1. Leaf of pepper, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 10.
3. " " ventral view, × 15.
4. Antenna, × 150.
5. Valves of anal operculum, × 100.
6. Stigmatic spines and marginal hairs, × 650.



E.E.Green del. P.W.M.T. impr. F. lith.

PROTOPULVINARIA LONGIVALVATA.

EXPLANATION OF PLATE XCVI.

CERONEMA KOEBELI.

Fig. 1. Branch of *Sapium sebiferum*, with insects, nat. size.
2. Adult female, before gestation, dorsal view, × 6.
3. " " ventral view, × 6.
4. " during formation of ovisac, side view, × 3.
5. " " dorsal view, × 4.
6. , dermal cells, × 250.
7 " foot, × 250
8. " anal operculum, × 100.
9. " stigmatic cleft with spines and marginal hairs, × 250.
10. " antenna (nine-jointed), × 100.
11. " " (eight-jointed), × 100.
12. Antenna of young larva.
13. Male puparium, × 13.
14. Adult male, dorsal view, × 20.
15. " head, from below, × 40.
16. " base of wing, with one of the halteres, × 40.

E.E.Green del. P.W.M.T. impr. C.F.S. lith.

CERONEMA KOEBELI.

EXPLANATION OF PLATE XCVII.

Pulvinaria thespesiæ.

Fig. 1. Leaf of *Thespesia populnea*, with insects, nat. size.
2. Antenna of female, × 100.
3. Anterior leg, × 100.
4. Margin, with stigmatic and marginal spines, × 250.
5. Anal operculum, × 250.
6. Male puparium, × 16.

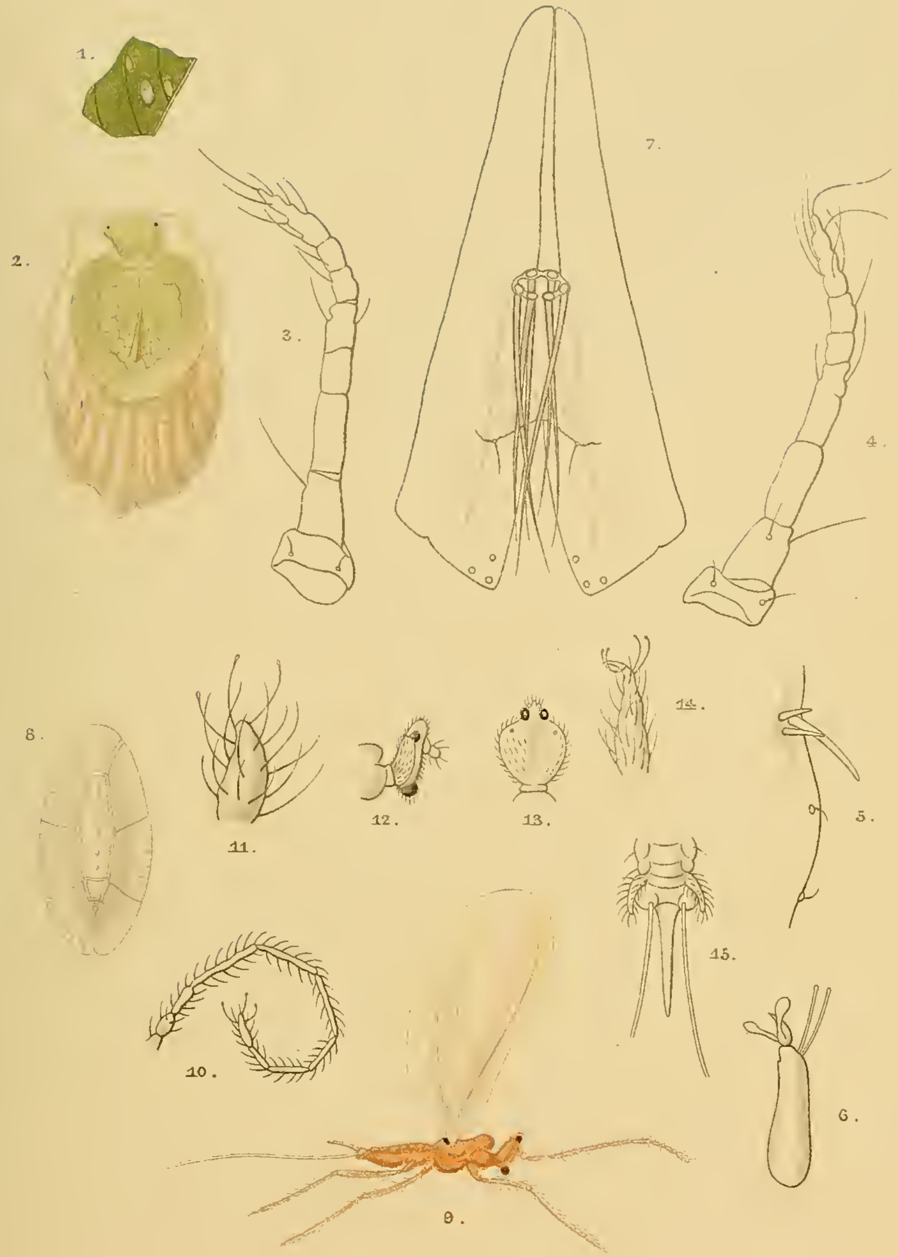
E.E.Green del. P.W.M.T. impr C.F.S. lith.

PULVINARIA THESPESIÆ.

EXPLANATION OF PLATE XCVIII.

PULVINARIA TESSELLATA.

Fig. 1. Portion of leaf with insect, nat. size.
2. Adult female and ovisac, × 12.
3. Antenna of female, × 250.
4. " " with fourth and fifth joints confluent, × 250.
5. Stigmatic spines and marginal hairs, × 450.
6. Foot of female.
7. Anal operculum, × 250.
8. Male puparium, dorsal view, × 15.
9. Adult male, side view, × 21.
10. Antenna of male.
11. Terminal joint of male antenna.
12. Head of male, side view.
13. " " from behind.
14. Foot of male.
15. Abdominal extremity of male, dorsal view.



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PULVINARIA TESSELLATA.

EXPLANATION OF PLATE XCIX.

PULVINARIA CELLULOSA.

Fig. 1. Young branch of *Citrus*, with insects, nat. size.
2. Adult female, dorsal view, before gestation, × 10.
3. „ „ part of scale, showing pigmented dermal cells, × 50.
4. „ „ with ovisac, × 8.
5. Stigmatic spines, × 100.
6. Antennæ, × 70.
7. Foot, × 100.
8. Anal operculum, × 100.
9. Dermal cells, × 100.
10. Marginal hairs, × 250.

E.E.Green del. W.M.T. impr F.S. lith.

PULVINARIA CELLULOSA.

EXPLANATION OF PLATE C.

PULVINARIA PSIDII.

Fig. 1. Fruit of *Tecoma stans*, with insects, nat. size.
2. Young larva, greatly enlarged.
3. Adult female, at time of commencement of ovisac, × 7.
4. " " with fully formed ovisac, dorsal view, × 9.
5. " " " " " " lateral view, × 9.
6. Anal operculum, from typical examples *ex* coll. W. M. Maskell, × 100
7. " " " examples from guava, × 100.
8. " " " " " tea, × 100.
9. " " " " " *Duranta*, × 10.
10, 11. " " " " " myrtle, × 100.
12. Stigmatic cleft, spines, and marginal hairs, × 250.
13. Antenna, × 10.
14. Foot, × 100.
15. Dermal cells, × 250.
16. Immature female, × 10.

E.E.Green del. F.W.M.T.impr. C.F.S.lith.

PULVINARIA PSIDII.

EXPLANATION OF PLATE CI.

Pulvinaria ixoræ.

Fig. 1. Antenna, × 250.
2. Stigmatic spines and marginal hairs, × 450.
3. Anal operculum, × 250.

Pulvinaria tomentosa.

Fig. 4. Insects, nat. size, on leaf and twig of food plant.
5. Adult female, dorsal view, with ovisac, × 9.
6. Antenna, with eight joints, × 100.
7. „ with seven joints, × 100.
8. Stigmatic cleft, spines, and marginal hairs, × 100.
9. Anal operculum, × 100.

PULVINARIA IXORÆ 1—3.
„ TOMENTOSA 4—9

EXPLANATION OF PLATE CII.

Ceroplastes ceriferus.

Fig. 1. Stem of *Antigonon*, with insects *in situ*, nat. size.
2. Test from below, showing under surface of adult female, nat. size.
3. Adult female, denuded of wax, side view, × 2.
4. „ „ dorsal view, × 2.
5. Portion of spiracular area, showing stigmatic spines, × 450.
6. Early adult female, denuded of wax, dorsal view, × 5.
7. „ „ extremity of caudal process, × 50.
8. „ „ side view, × 12.
9. Antenna of adult female, six-jointed form, × 160.
10. „ „ five-jointed form, × 250.
11. Test of nymphal female, side view, × 10.
12. Nymphal female, denuded of wax, × 15.
13. Test of nymphal female, earlier stage, side view, × 15.
14. Larva, showing early formation of test, dorsal view, × 20.
15. Foot of adult female, × 450.

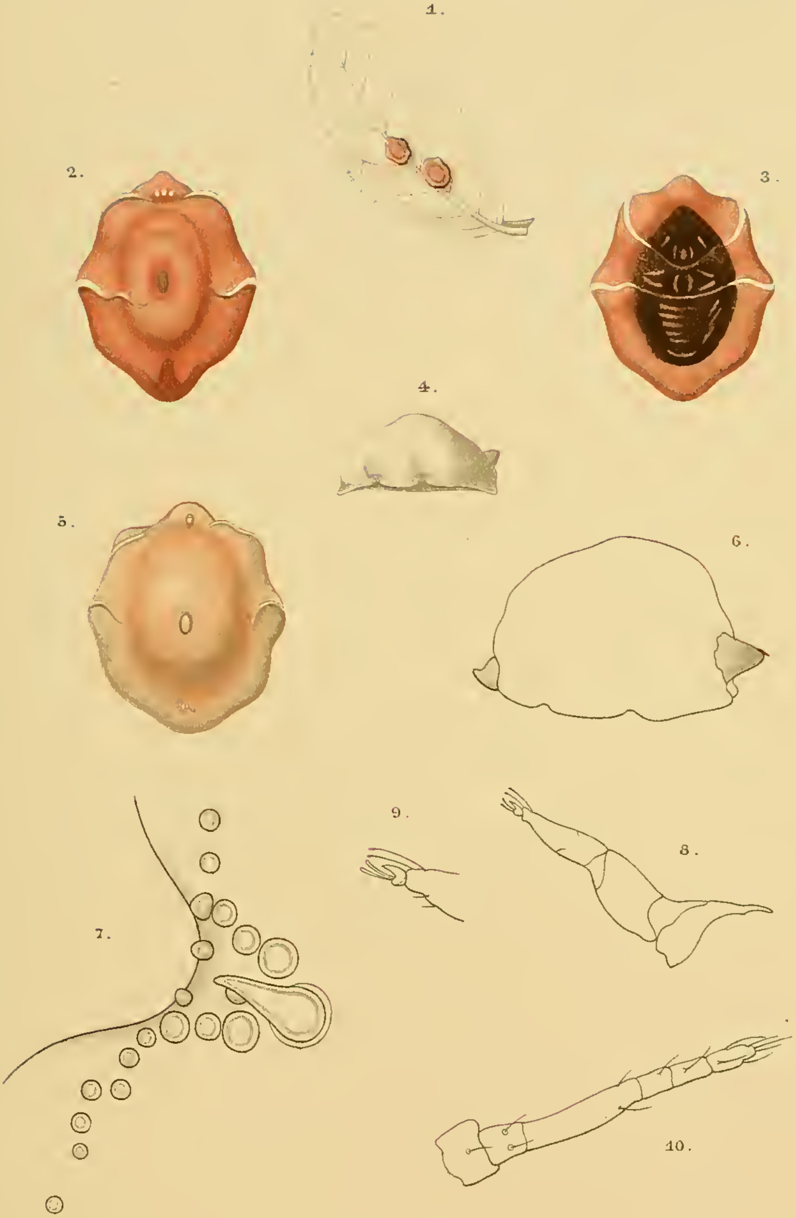
E.E.Green del. P.W.M.T impr. G.F.S.lith.

CEROPLASTES CERIFERUS.

EXPLANATION OF PLATE CIII.

CEROPLASTES RUBENS.

Fig. 1. Tea leaf, with insects, nat. size.
2. Female, young adult, dorsal view, × 8.
3. „ „ ventral view, × 8.
4. „ „ side view, denuded of wax, × 8.
5. „ old adult, dorsal view, × 8.
6. „ „ denuded of wax, side view, × 15.
7. Stigmatic area and stigmatic spines, × 250.
8. Leg, × 250.
9. Foot, × 450.
10. Antenna, × 250.



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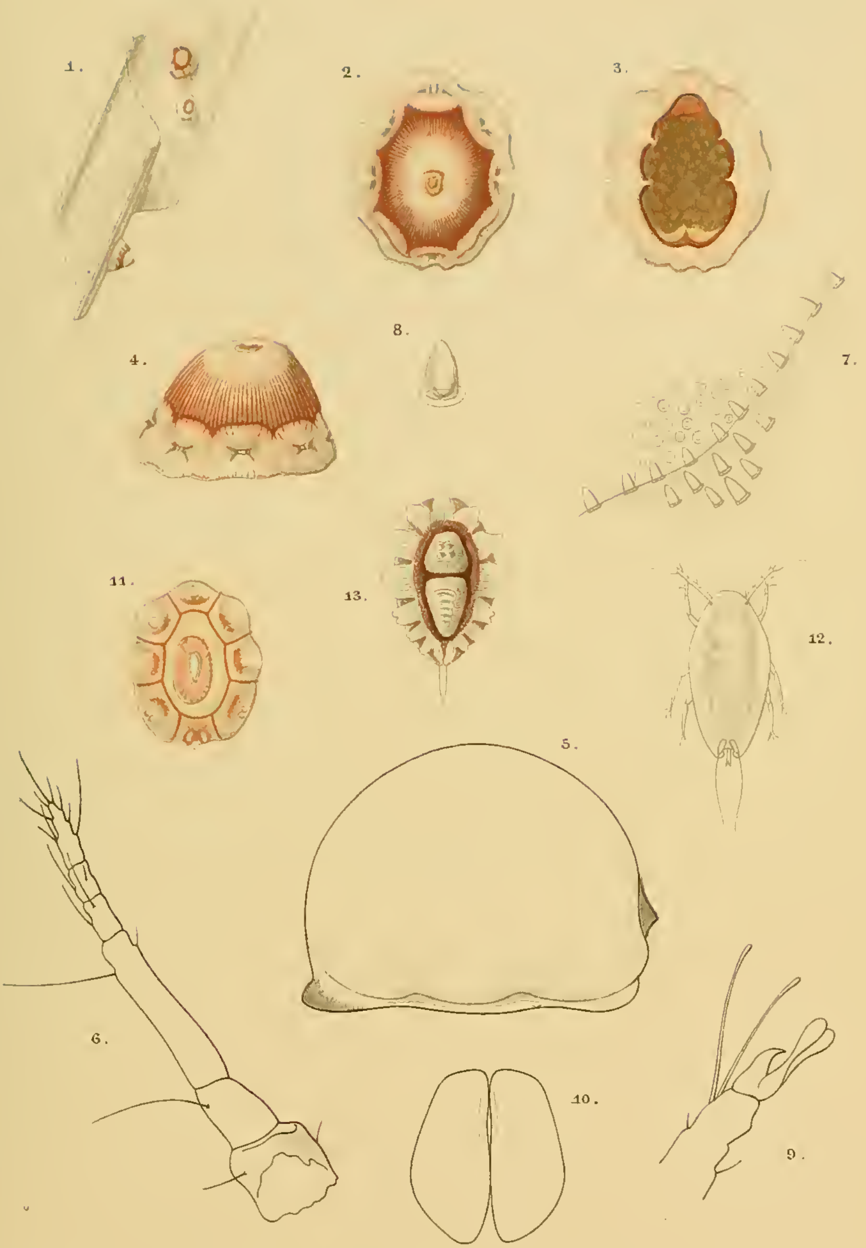
CEROPLASTES RUBENS.

EXPLANATION OF PLATE CIV

CEROPLASTES ACTINIFORMIS.

Fig. 1. Section of palm frond, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 6.
3. " ventral view, × 6.
4. " side view, × 6.
5. " denuded of wax, side view, × 15.
6. Antenna of adult female, × 250.
7. Stigmatic area, showing stigmatic spines, × 250.
8. A single stigmatic spine, × 500.
9. Foot, × 450.
10. Valves of anal operculum, × 250.
11. Immature female, dorsal view, × 12.
12. Newly hatched larva, × 65.
13. Larva, at tenth day, × 50.



E.E. Green del. P.W.M.T. impr. G.F.S. lith.

CEROPLASTES ACTINIFORMIS.

EXPLANATION OF PLATE CV.

CEROPLASTES FLORIDENSIS.

Fig. 1. Leaf of avocado pear, with insects *in situ*, nat. size.
2. Adult female, dorsal view, × 10.
3. „ with eccentric apex, × 10.
4. „ from behind, × 10.
5. „ ventral view, after deposition of eggs, × 10.
6. „ before deposition of eggs, × 10.
7. Early adult female, after treatment with caustic potash, × 30.
8. Stigmatic cleft, with stigmatic and marginal spines, × 450.
9. „ with bifid stigmatic spines, × 450.
10. Antenna, × 250.
11. Female of second (nymphal) stage, × 15.
12. „ larval stage, × 15.
13. Adult female, denuded of wax, lateral view, × 15.
14. Anal operculum, × 250.
15. Foot, × 450.

E.E. Green del.   P.W.M.T. impr.   C.F.S. lith.

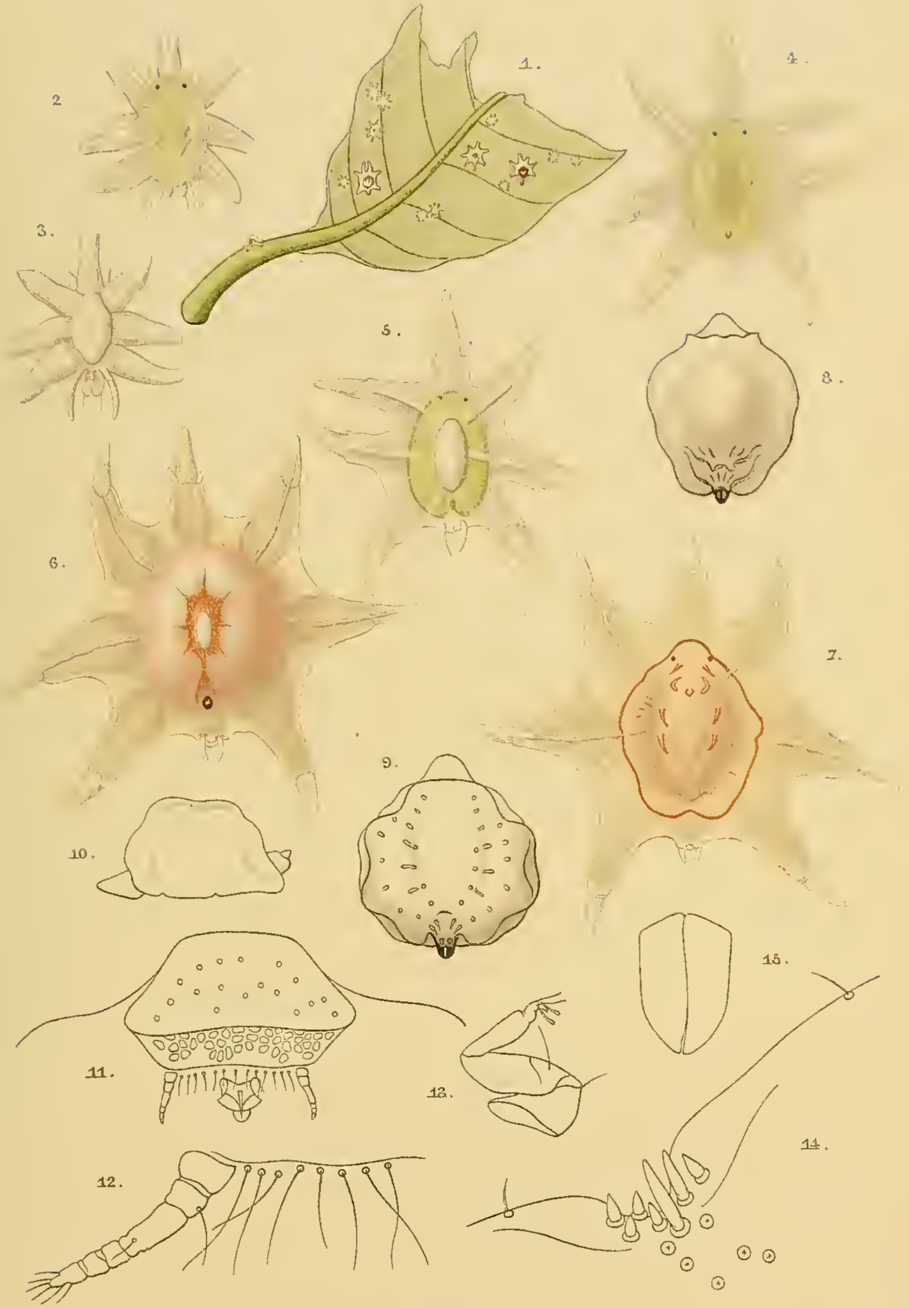
CEROPLASTES FLORIDENSIS.

EXPLANATION OF PLATE CVI.

Vinsonia stellifera.

Fig. 1. Mango leaf, with insects *in situ*, nat. size.
2. Larva, ventral view, × 25.
3. „ dorsal view, × 25.
4. Nymphal female, ventral view, × 20.
5. „ dorsal view, × 20.
6. Adult female, dorsal view, × 15.
7. „ ventral view, × 15.
8. Early adult female, denuded of wax, dorsal view, × 15.
9. Older female, denuded of wax, dorsal view, × 15.
10. „ „ „ side view, × 15.
11. Cephalic lobe, from below, × 70.
12. Antenna, × 250.
13. Anterior leg, × 250.
14. Stigmatic cleft and spines, from below, × 450.
15. Valves of anal operculum, × 250.

Pl. CVI.



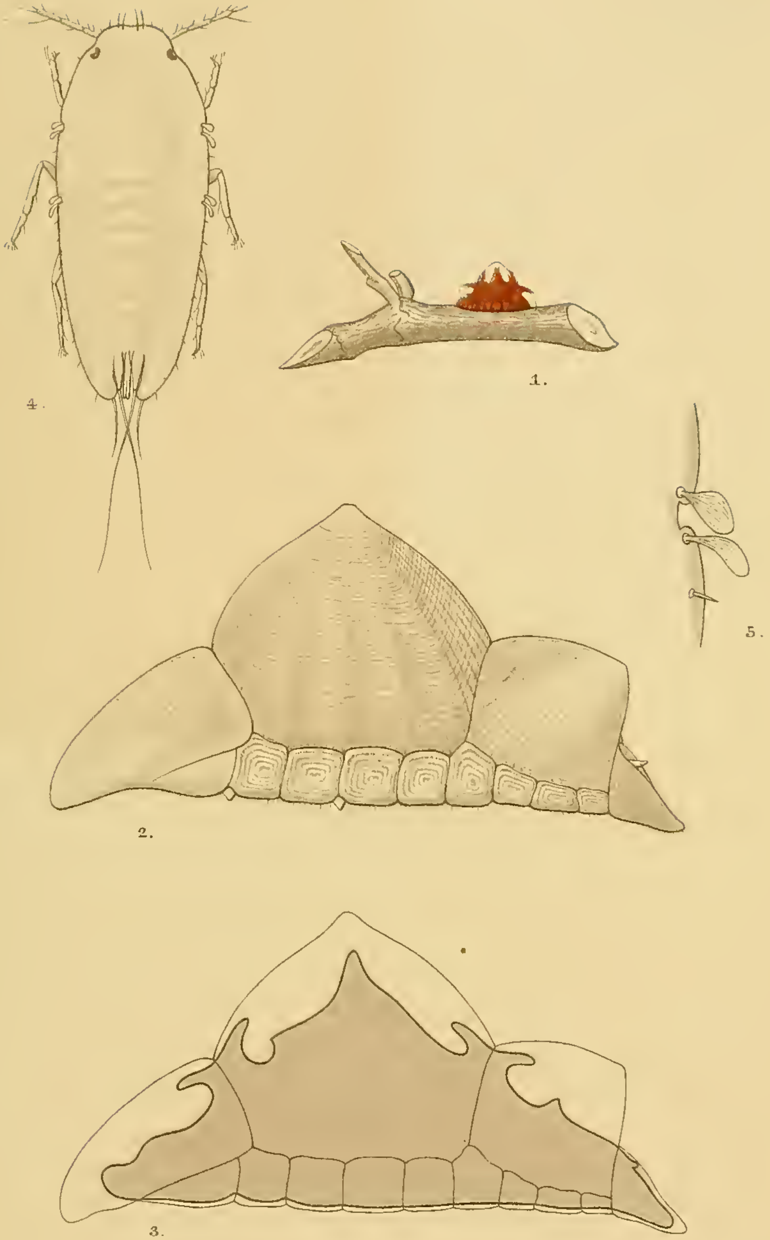
E.E.Green del. P.W.M.T.impr. C.F.S lith.

VINSONIA STELLIFERA.

EXPLANATION OF PLATE CVII.

Inglisia cheloniоides.

Fig. 1. Adult female, *in situ*, × 1·25.
2. Test of female, side view, × 10.
3. Diagram, showing area occupied by the body of the insect, × 10.
4. Newly hatched larva, dorsal view, × 100.
5. „ „ „ stigmatic area, × 500.



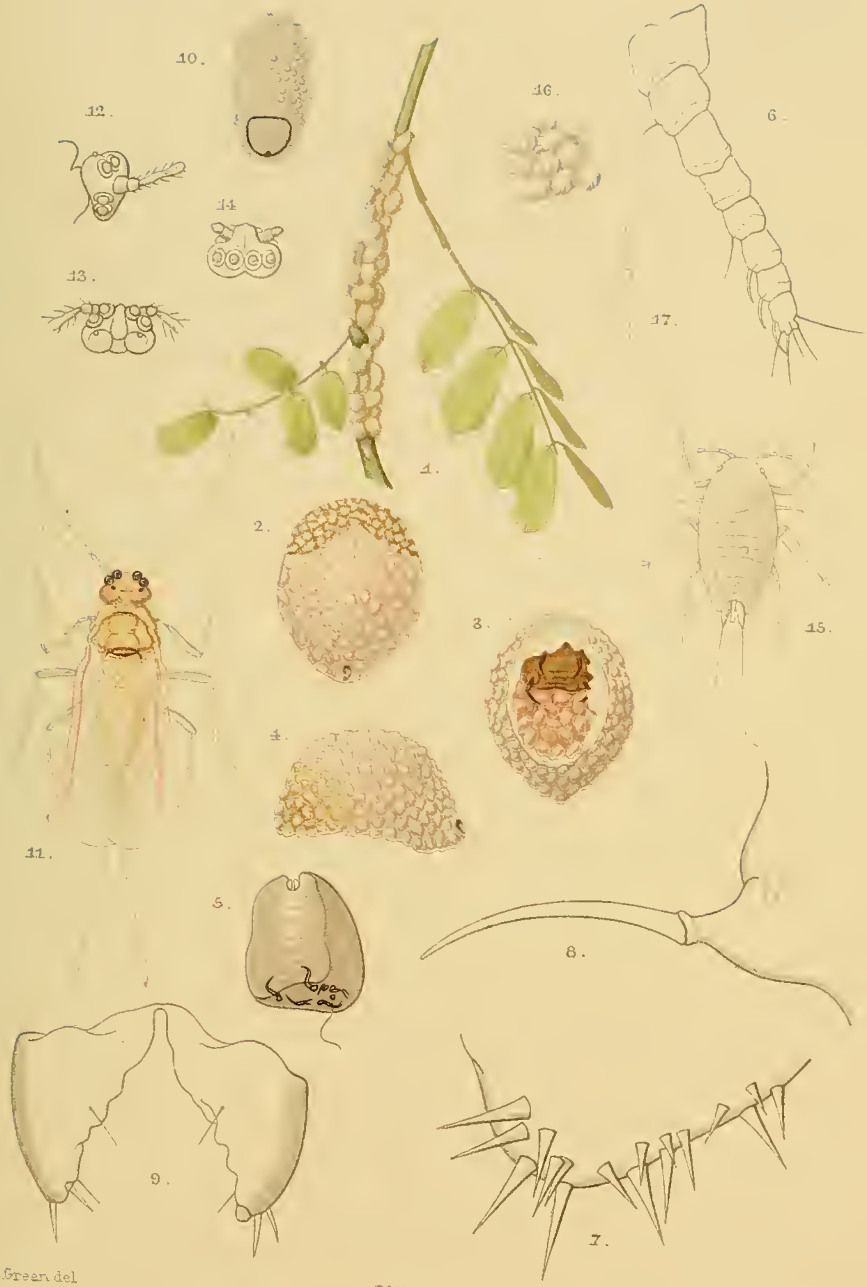
E.E.Green del. P.W.M.T. impr G.F.S. lith

INGLISIA CHELONIOIDES.

EXPLANATION OF PLATE CVIII.

CEROPLASTODES CAJANI.

Fig. 1. Insects clustered on stem of *Abrus precatorius*, nat. size.
2. Test of adult female, dorsal view, × 8.
3. „ „ ventral view, × 8.
4. „ „ side view, × 8.
5. Adult female, removed from test, postero-lateral view, × 12.
6. „ antenna, × 250.
7. „ spines of posterior margin, × 250.
8. „ stigmatic spine, × 250.
9. „ anal operculum, × 450.
10. Male puparium, × 13.
11. Adult male, × 10.
12. „ head, side view, × 30.
13. „ „ dorsal view, × 30.
14. , „ ventral view, × 30.
15. Young larva, dorsal view, × 75.
16. Dorsal processes of older larva, × 250.
17. Marginal process of „ × 250.



E.E.Green del.

P.W.M.T. impr.

C.F.S. lith.

CEROPLASTODES CAJANI.

EXPLANATION OF PLATE CIX.

Ceroplastodes chiton.

Fig. 1. Insects on twig of *Cassia*, nat. size.
2. Test of adult female, dorsal view, × 8.
3. Antenna, × 250.
4. Foot, × 450.
5. Stigmatic and marginal spines, × 250.
6. Posterior extremity, with everted anal tube, × 100.

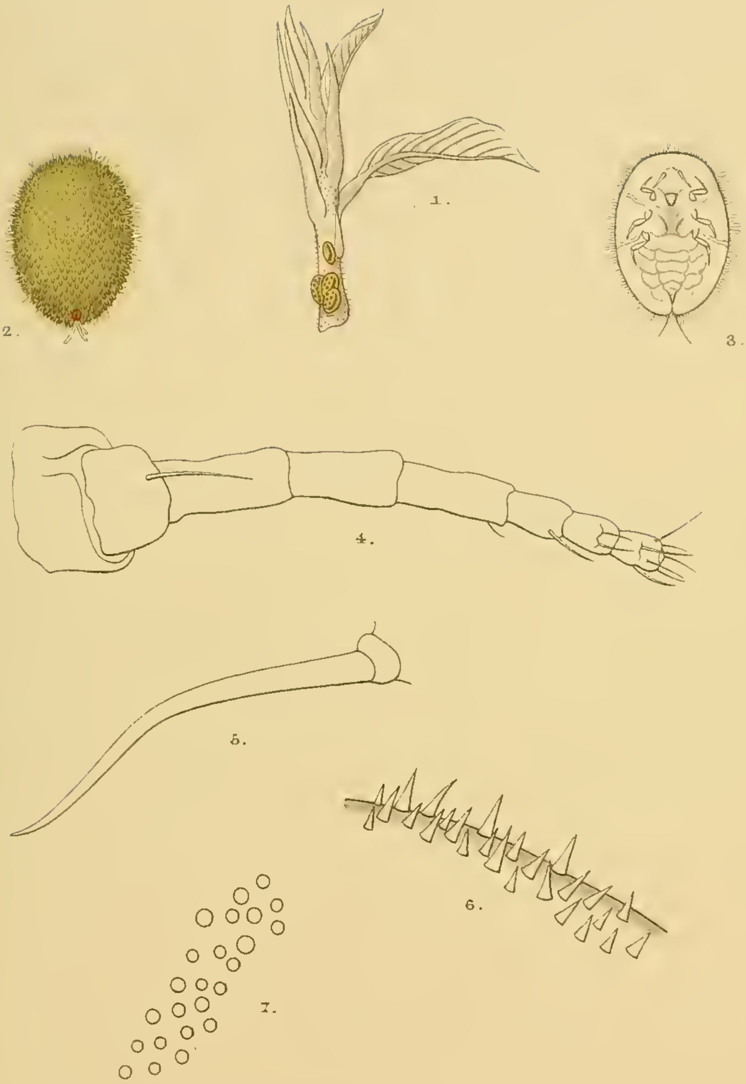
E.E.Green del. I.W.M.T. impr. C.F.S lith.

CEROPLASTODES CHITON.

EXPLANATION OF PLATE CX.

CEROPLASTODES VIRESCENS.

Fig. 1. Insects on terminal shoot of *Theobroma cacao*, nat. size.
2. Early adult female, dorsal view, × 7.
3. " " ventral view, × 7.
4. Antenna of fully grown female, × 250.
5. Stigmatic spine, × 250.
6. Marginal spines, × 250.
7. Plan showing disposition of marginal spines, × 250.



E.E.Green del. P.W.M.T. impr. J.E.S. lith

CEROPLASTODES VIRESCENS.

EXPLANATION OF PLATE CXI.

ACLERDA DISTORTA.

Fig. 1. Adult male, dorsal view, × 20.
2. „ „ underside of head, × 20.
3. „ „ terminal joint of antenna, × 170.
4. „ „ foot, × 170.
5. Male puparium, × 10.
6. Branch of *Arundinaria*, with insects *in situ*, nat. size.
7. Early adult female, ventral view, × 8.
8. „ „ „ dorsal view, × 8.
9. Female, second stage, dorsal view, × 8.
10. Adult female, broad form, from larger branches, × 3.
11. Portion of stem, enlarged, showing insect *in situ*, × 5.
12. Adult female, narrow form, side view, × 5.
13. Young larva, dorsal view, × 40.
14. „ „ posterior extremity, dorsal view, × 450.
15. Abdominal margin of slightly older larva, × 450.
16. Posterior extremity of adult female, dorsal view, × 250.
17. „ „ „ „ ventral „ × 250.
18. Posterior extremity of nymph, dorsal view, × 250.
19. Thoracic margin of adult female, × 450.
20. Abdominal margin of adult female, × 450.

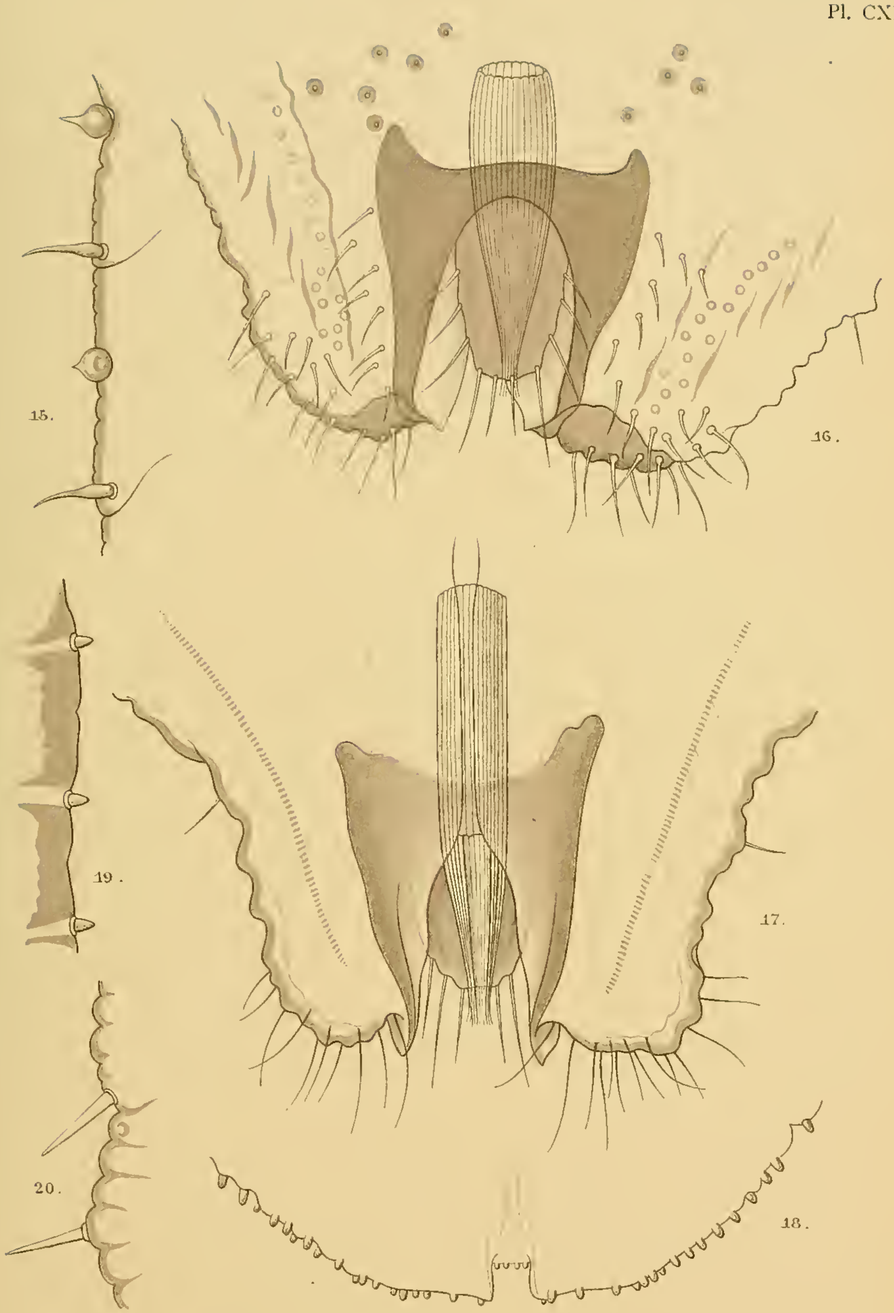
Pl. CXI.

E.E.Green del.

F.W.M.T. impr.

G.F.S. lith.

ACLERDA DISTORTA.



E.E. Green del   P.W.M.T impr.   C.E.S. lith.

ACLERDA DISTORTA.

EXPLANATION OF PLATE CXII.

LECANIODIASPIS AZADIRACHTÆ.

Fig. 1. Insects on branch of *Azadirachta*, nat. size.
2. Test of female, dorsal view, × 12.
3. Female insect, dorsal view, × 25.
4. Antenna, × 250.
5. Stigmatic spines, × 450.
6. Anal segment, dorsal view, × 250.
7. Cribriform plate, × 450.
8. Paired glands, × 600.
9. Anterior limb, × 250.
10. Posterior limb, × 250.
11. Dorsal spines, × 450.

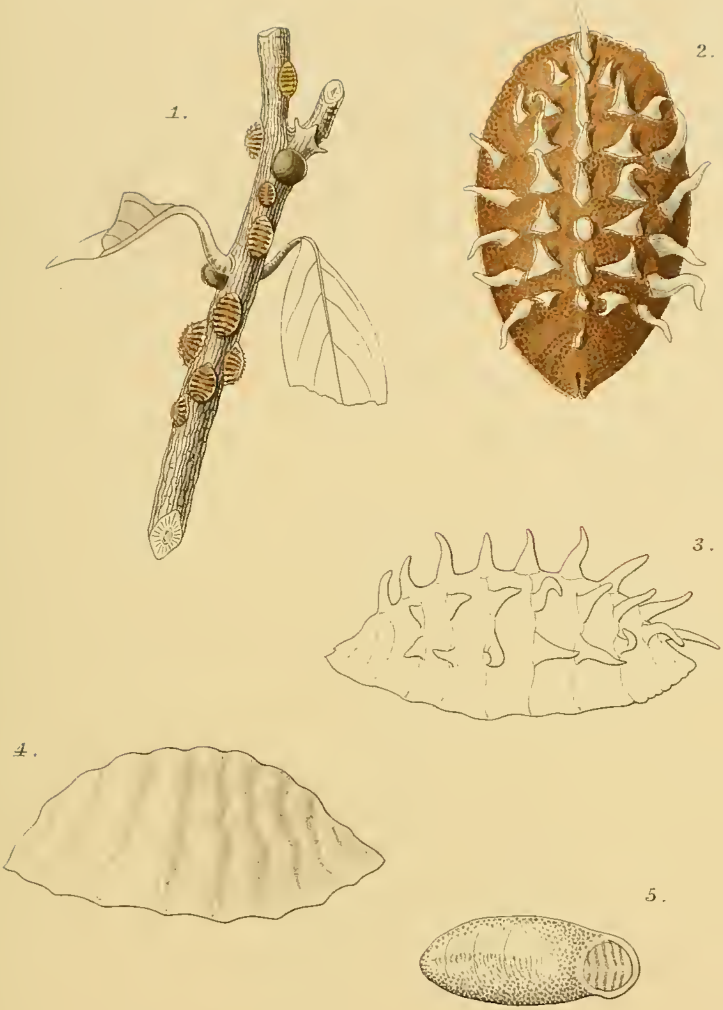
E.E.Green del. P.W.M.T.impr. C.E.S.lith.

LECANIODIASPIS AZADIRACHTÆ.

EXPLANATION OF PLATE CXIII.

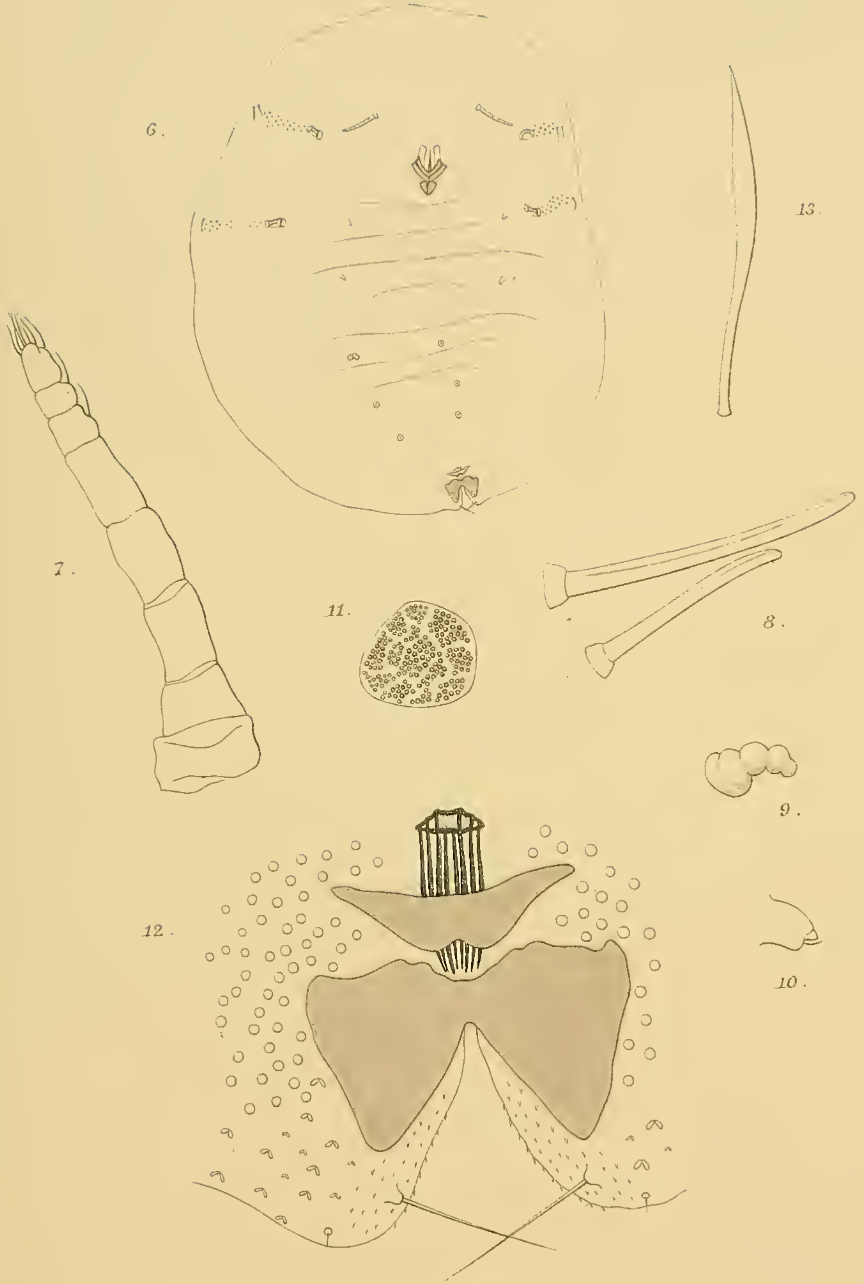
LECANIODIASPIS MALABODA.

Fig. 1. Insects on branch of *Myristica*, nat. size.
2. Fresh test of adult female, dorsal view, × 12.
3. ,, ,, side view, × 12.
4. Worn test of female, side view, × 12.
5. Male puparium, dorsal view, × 15.
6. Adult female insect, optical section, × 25.
7. Antenna of adult female, × 250.
8. Anterior stigmatic spines, × 450.
9. Anterior rudimentary limb, × 450.
10. Mid limb, × 450.
11. Cribriform plate, × 450.
12. Anal segment, × 250.
13. Hair from anal ring, × 450.



E.E.Green del P.W.M.T.impr. F.S.lith.

LECANIODIASPIS MALABODA.



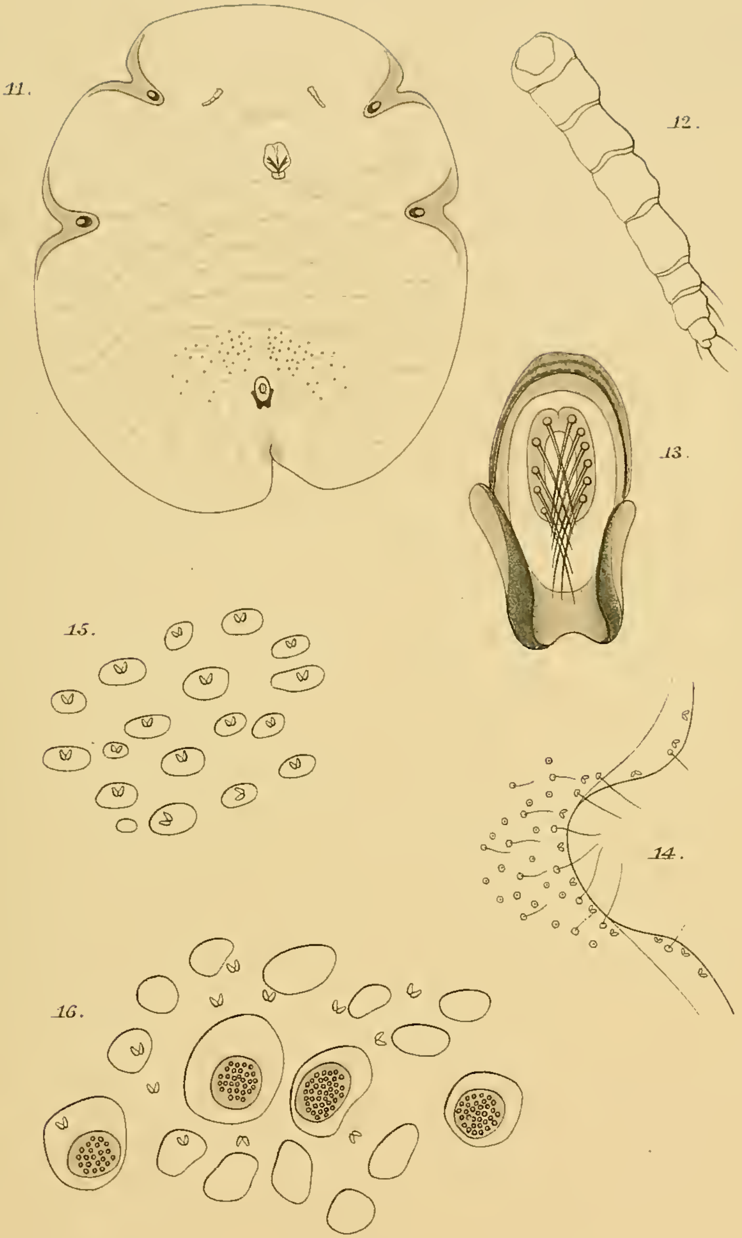
E.E.Green del.   P.W.M.I. impr.   C.F.S. lith.

LECANIODIASPIS MALABODA.

EXPLANATION OF PLATE CXIV.

Anomalococcus cremastogastri.

Fig. 1. Insects, in shelter constructed by ants, nat. size.
2. Early adult female, dorsal view, × 10.
3. Old adult female, side view, × 10.
4. Male puparium, side view, × 15.
5. Larva, shortly before moult, dorsal view, × 40.
6. Younger larva, ventral view, × 75.
7. Posterior extremity of young larva, dorsal view, × 250.
8. Margin of larva, showing stigmatic spines, × 300.
9. Early nymph, ventral view, × 40.
10. Antenna of nymph, × 450.
11. Adult female, optical section, × 25.
12. Antenna of adult female, × 250.
13. Anal aperture of adult female, × 250.
14. Stigmatic cleft of adult female, dorsal aspect, × 250.
15. Dermal cells of median area, × 450.
16. Dermal cells of abdominal area, × 450.



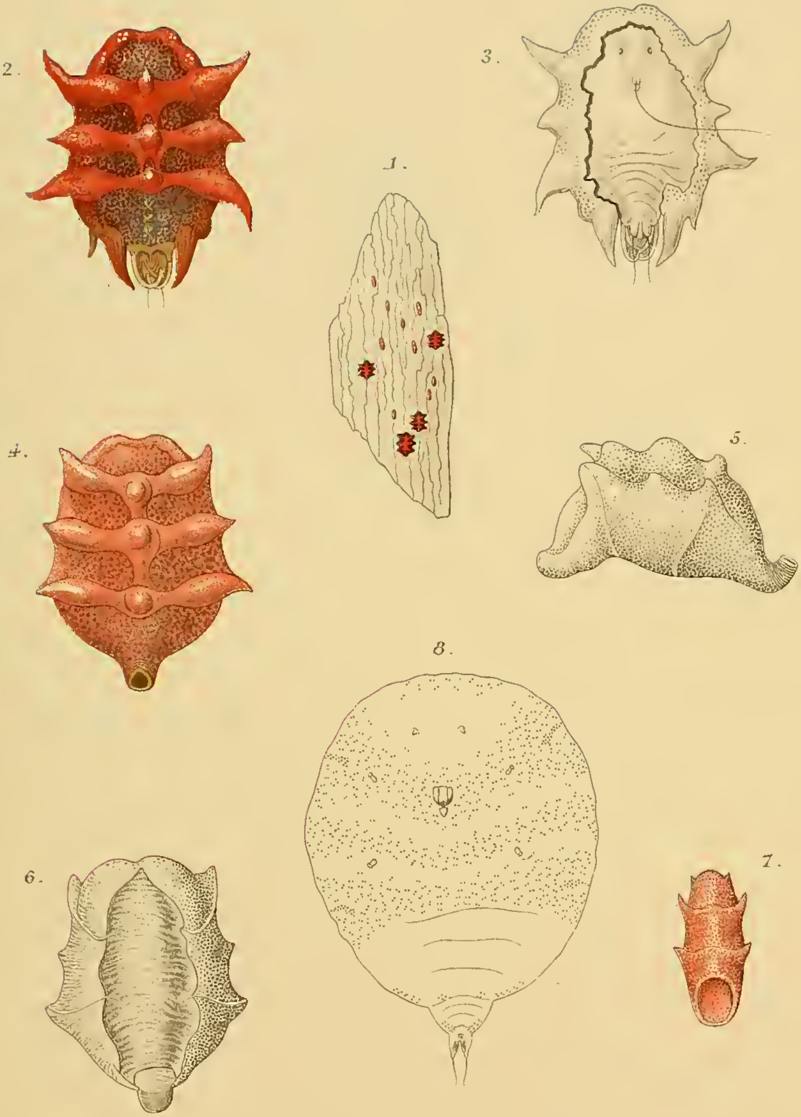
E.E. Green del. P.W.M.T. impr. C.F.S. lith.

ANOMALOCOCCUS CREMASTOGASTRI.

EXPLANATION OF PLATE CXV.

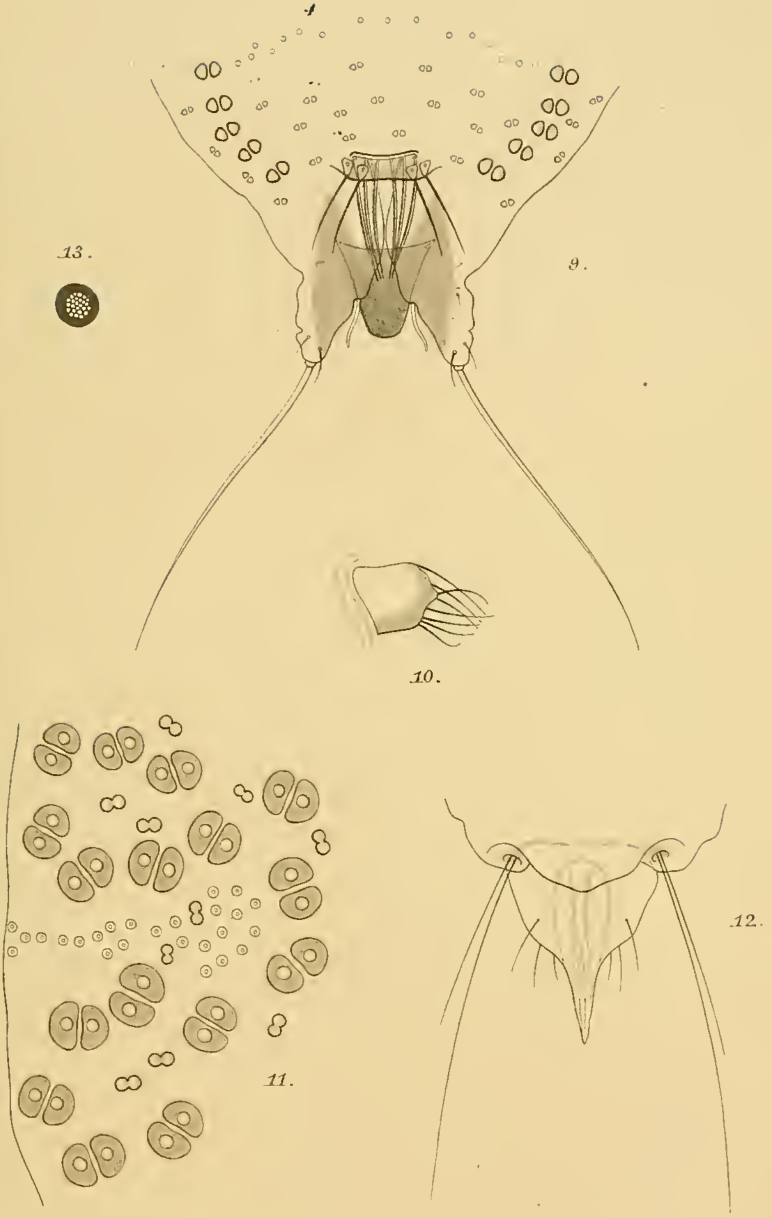
Cerococcus ornatus.

Fig. 1. Insects on bark of coffee tree, nat. size.
2. Early test of adult female, dorsal view, × 17.
3. " " ventral view, with part of test broken away, showing insect *in situ*, × 17.
4. Older test of female, dorsal view, × 17.
5. " " side view, × 17.
6. " " ventral view, × 17.
7. Male puparium, dorsal view, × 20.
8. Female insect, optical section, × 25.
9. Anal segment of female, × 250.
10. Antenna of adult female, × 450.
11. Part of marginal area, showing the several forms of glands, × 450.
12. Abdominal extremity of adult male, × 250.
13. Cribriform plate, × 600.



E.E.Green del. P.W.M.T impr. F.S lith.

CEROCOCCUS ORNATUS.



E.E.Green del. P.W.M.T. impr. C.F.S. lith.

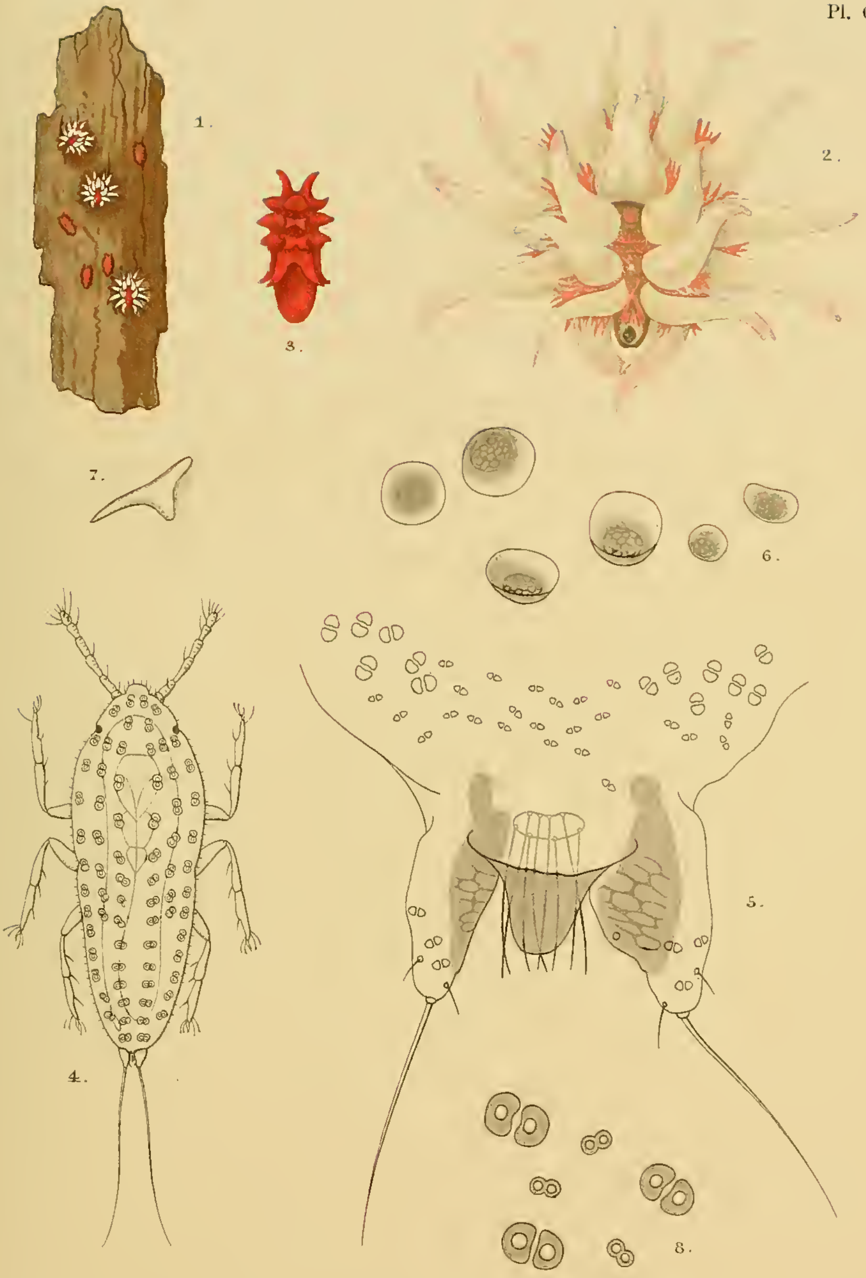
CEROCOCCUS ORNATUS.

EXPLANATION OF PLATE CXVI.

CEROCOCCUS ALBOSPICATUS.

Fig. 1. Insects on bark of *Symplocos*, nat. size.
2. Test of adult female, dorsal view, × 10.
3. Male puparium, dorsal view, × 10.
4. Young larva, × 75.
5. Anal segment of adult female, optical section, × 250.
6. Group of cribriform plates, × 600.
7. Rudimentary limb, × 450.
8. Dorsal paired glands, × 450.

Pl. CXVI



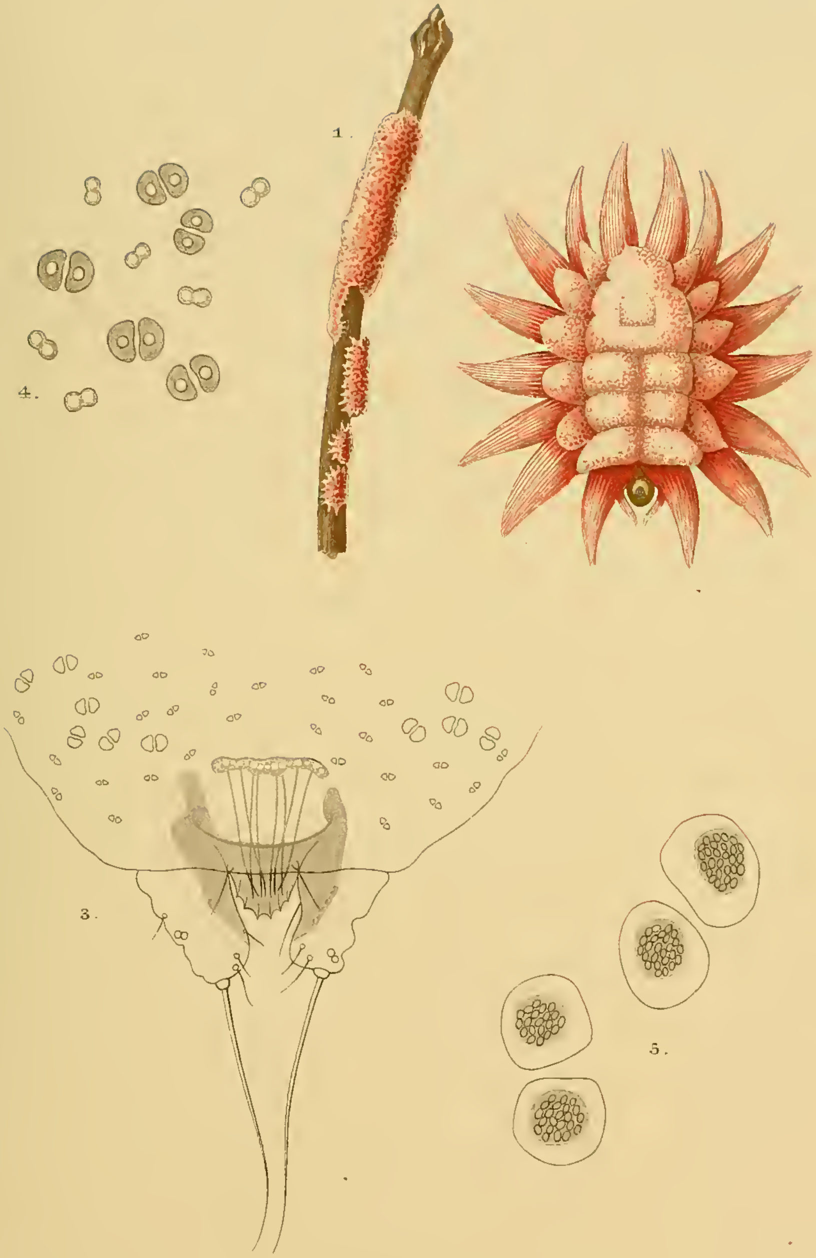
E.E.Green del. P.W.M.T. impr. C.F.S. lith.

CEROCOCCUS ALBOSPICATUS.

EXPLANATION OF PLATE CXVII.

CEROCOCCUS ROSEUS.

Fig. 1. Insects massed on branch, nat. size.
2. Test of adult female, dorsal view, × 10.
3. Anal segment of female, from below, optical section, × 250.
4. Dorsal paired glands, × 450.
5. Cribriform plates, × 600.



E.E.Green del. P.W.M.T.impr. J.E.S. lith.

CEROCOCCUS ROSEUS.

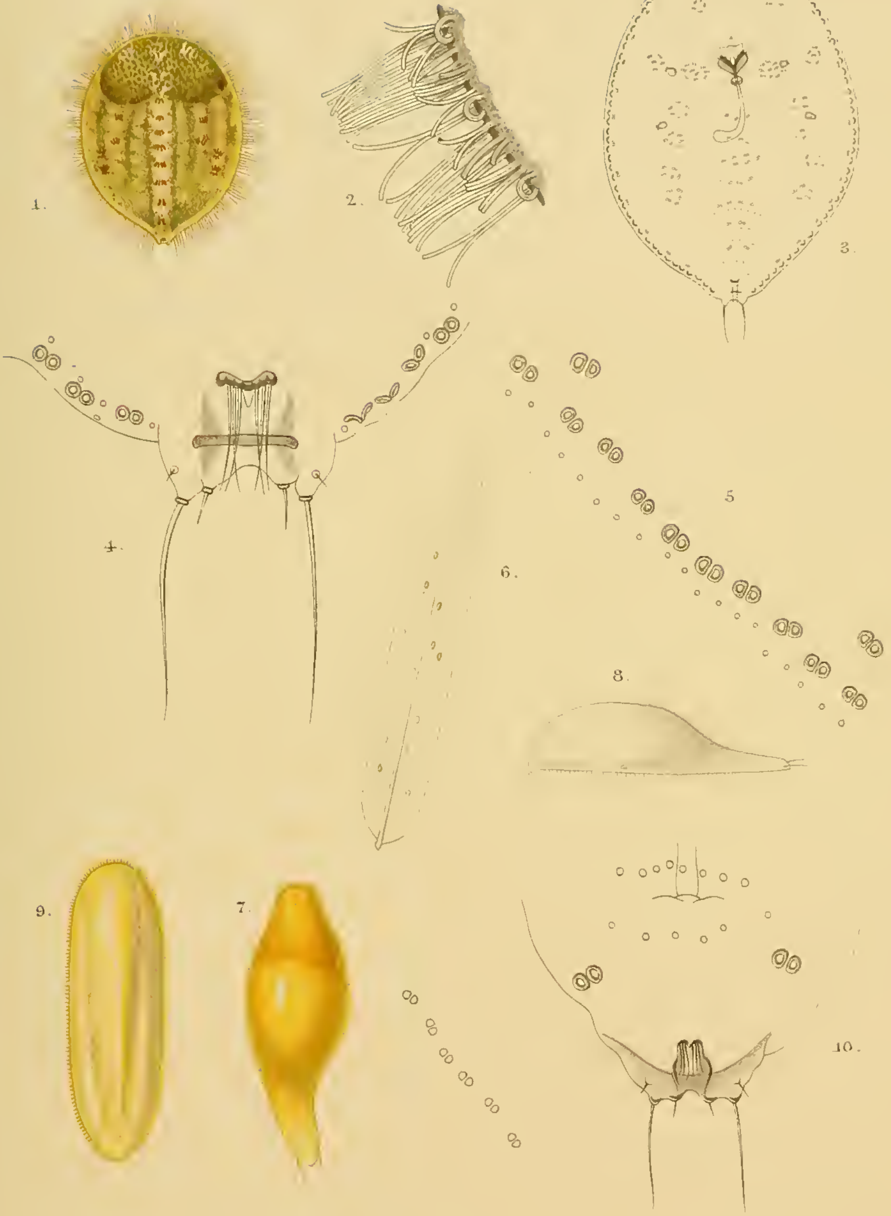
EXPLANATION OF PLATE CXVIII.

Asterolecanium aureum.

Fig. 1. Test of adult female, dorsal view, × 20.
2. Marginal fringe, × 100.
3. Adult female, optical section, × 60.
4. Posterior extremity of female, × 450.
5. Marginal glands, × 450.

Asterolecanium exiguum.

Fig. 6. Insects on leaf of bamboo, nat. size.
7. Test of adult female, dorsal view, × 50.
8. ,, ,, lateral view, × 50.
9. Male puparium, dorsal view, × 50.
10. Abdominal extremity of adult female, optical section, × 450.
11. Marginal glands of adult female, × 450.



E.E.Green del. P.W.M.T.impr lith.

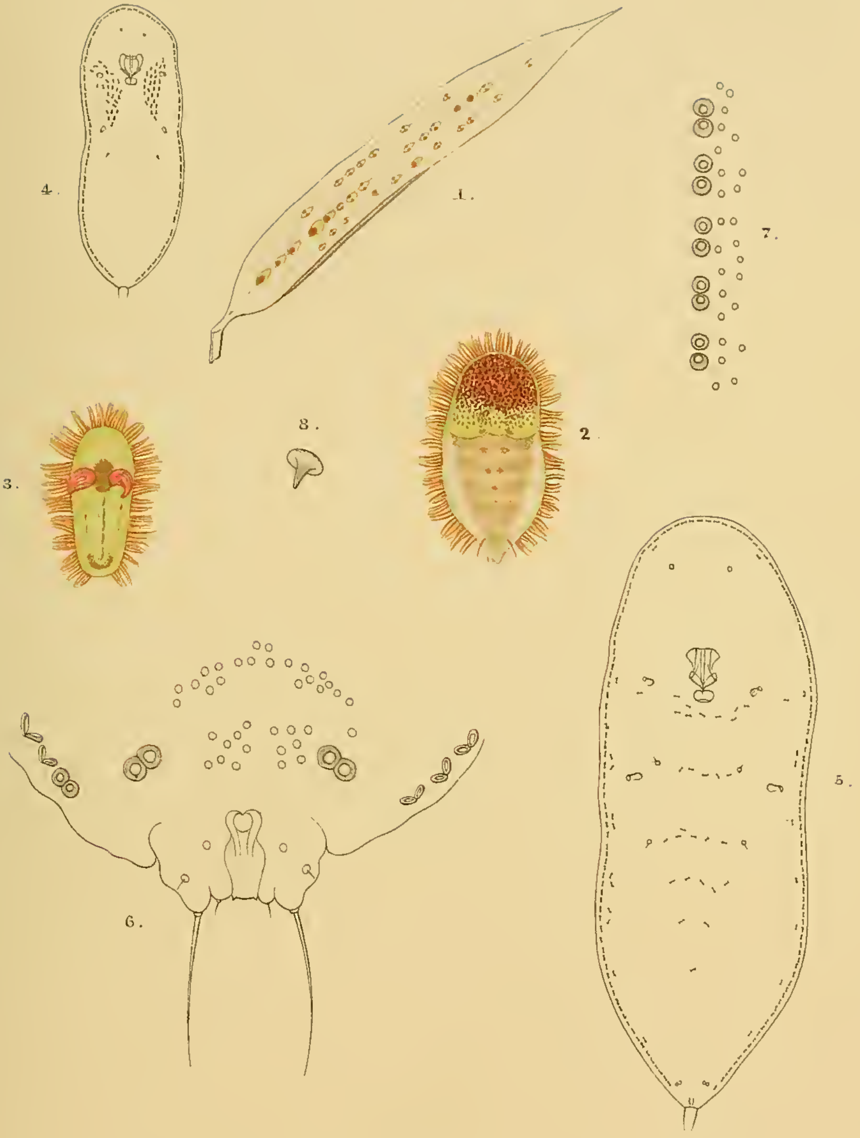
ASTEROLECANIUM AUREUM 1—5.
ASTEROLECANIUM EXIGUUM 6—11.

EXPLANATION OF PLATE CXIX.

Asterolecanium rubrocomatum.

Fig. 1. Insects on leaf of bamboo, nat. size.
2. Test of adult female, dorsal view, × 16.
3. Male puparium, dorsal view, × 16.
4. Male subnymph, optical section, × 50.
5. Adult female, optical section, × 50.
6. Posterior extremity of female, × 450.
7. Marginal glands of female, × 450.
8. One of the ventral spines of adult female, × 450

Pl. CXIX



E.E.Green del. P.W.M.T. impr. C.F.S. lith.

ASTEROLECANIUM RUBROCOMATUM.

EXPLANATION OF PLATE CXX.

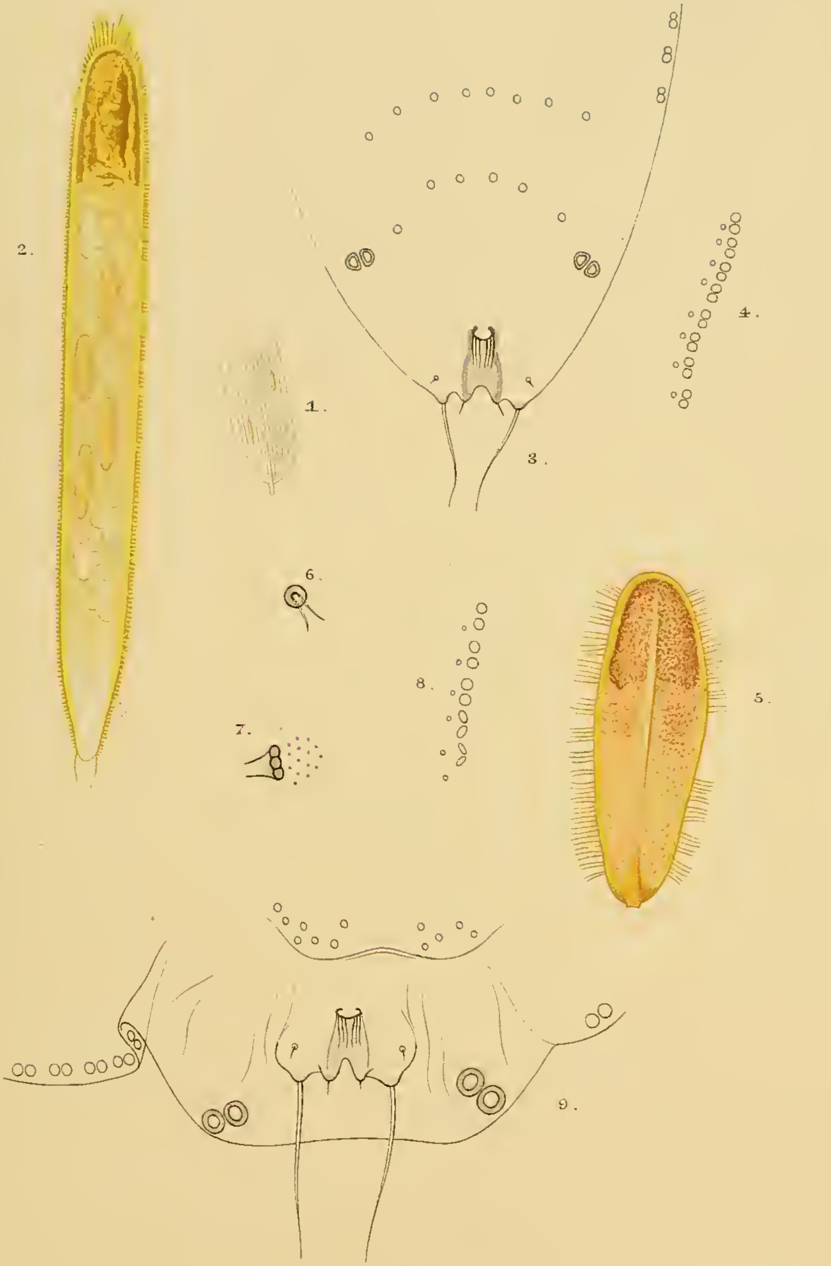
Asterolecanium tenuissimum.

Fig. 1. Female insects, on leaf of bamboo, nat. size.
2. Test of female, dorsal view, × 50.
3. Abdominal extremity of female (optical section), × 450.
4. Marginal glands of female, × 450.

Asterolecanium udagamæ.

Fig. 5. Test of female, dorsal view, × 25.
6. Antenna of female, × 450.
7. Stigmatic opening, × 450.
8. Marginal glands, × 450.
9. Abdominal extremity (optical section), × 450.

Pl. CXX



E.E.Green del. P.W.M.T.impr. C.E.S.lith.

ASTEROLECANIUM TENUISSIMUM 1—4.
" UDAGAMÆ 5—9.

EXPLANATION OF PLATE CXXI.

Asterolecanium flavociliatum.

Fig. 1. Branch of *Arundinaria*, with insects, nat. size.
2. Test of female, dorsal view, × 20.
3. „ „ lateral view, × 20.
4. Marginal glands of adult female, × 450.
5. Posterior extremity of female, × 450.

Asterolecanium tumidum.

Fig. 6. Test of adult female, dorsal view, × 50.
7. „ „ side view, × 50.
8. Part of marginal fringe, × 200.
9. Abdominal extremity of adult female, × 450.
10. Marginal glands, × 450.

E. E. Green del. P. W. M. T. impr. C. F. S. lith.

ASTEROLECANIUM FLAVOCILIATUM 1—5.
„ TUMIDUM 6—10.

EXPLANATION OF PLATE CXXII.

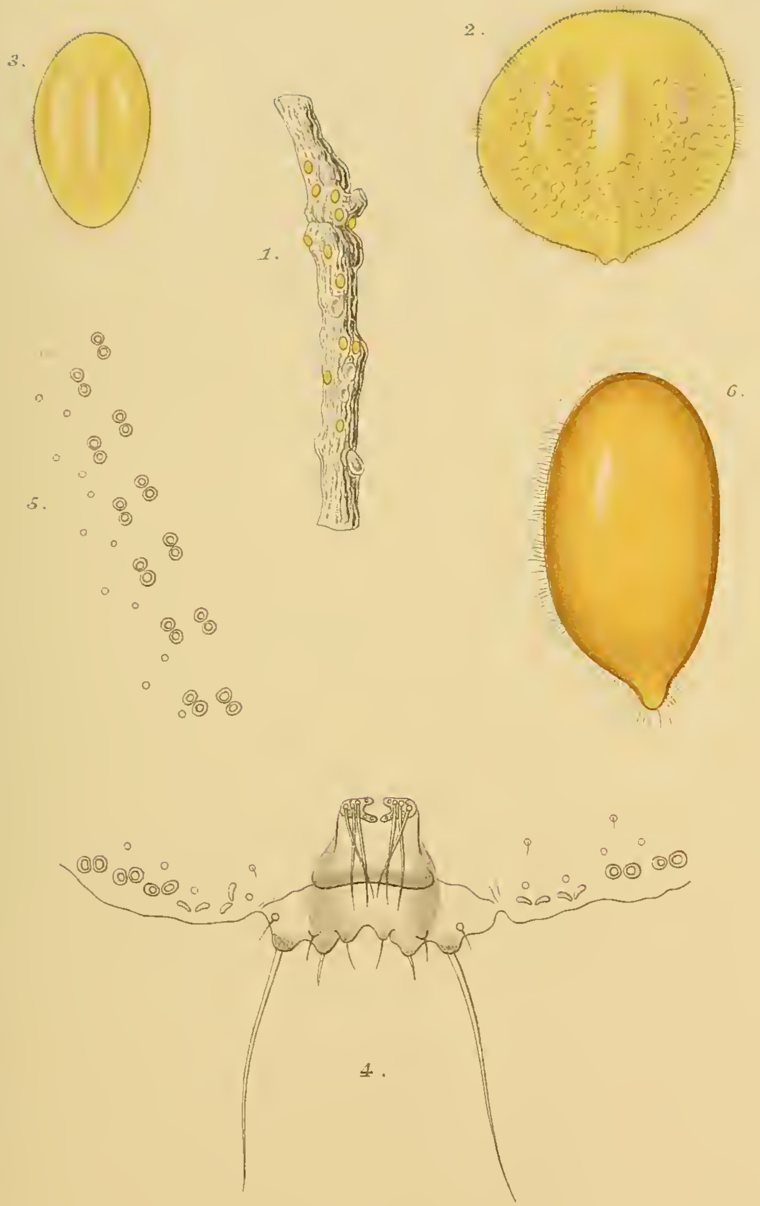
Asterolecanium thespesiæ.

Fig. 1. Insects on branch of *Thespesia*, nat. size.
2. Test of adult female, dorsal view, × 25.
3. Male puparium, dorsal view, × 25.
4. Abdominal extremity of adult female, optical section, × 450.
5. Marginal glands, × 450.

Asterolecanium pudibundum.

Fig. 6. Test of adult female, dorsal view, × 25.
7. Posterior extremity of female, after oviposition, × 75.
8. „ „ before oviposition, × 75.
9. „ „ × 450.
10. Marginal and dorsal glands, × 450.

Pl. CXXII



E.E. Green. del. P.W.M.T. impr. C.F.S. lith.

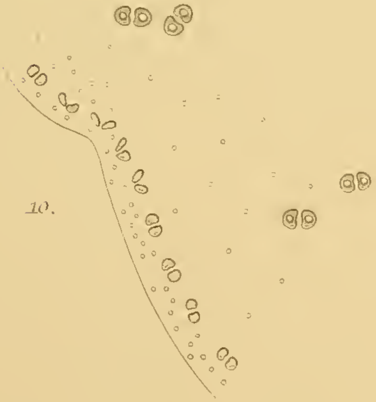
ASTEROLECANIUM THESPESIÆ 1—5.
„ PUDIBUNDUM 6.

Pl. CXXII*a*

7.

8.

9.



10.

E.E.Green del. P.W.M.T. impr. C.F.S. lith.

ASTEROLECANIUM PUDIBUNDUM.

EXPLANATION OF PLATE CXXIII.

Asterolecanium ceriferum.

Fig. 1. Leaf of bamboo, with insects *in situ*, nat. size.
2. Upper surface of leaf, showing ridges of hypertrophied cells above the position of the insect, × 20.
3. Test of adult female, dorsal view, × 23.
4. Test of female, side view, × 23.
5. ,, ,, ,, var. *prominens*, × 23.
6. Male puparium, × 23.
7. Embryonic larva, × 250.
8. Marginal glands from front of adult female, × 450.
9. Marginal glands from median area, × 450.
10. Posterior extremity of adult female, × 450.

Pl. CXXIII

E.E.Green del.   P.W.M.T. impr.   C.E.S. lith.

ASTEROLECANIUM CERIFERUM.

EXLANATION OF PLATE CXXIV.

Asterolecanium coronatum.

Fig. 1. Insects on stem of 'Giant Bamboo,' nat. size.
2. Test of adult female, dorsal view, × 36.
3. „ „ lateral view, × 36.
4. „ „ ventral view, × 36.
5. Male puparium, dorsal view, × 36.
6. Adult female, optical section, × 70.
7. Abdominal extremity of female, × 450.
8. Paired glands from dorsum of female, × 450.
9. Marginal glands of female, × 450.

Pl. CXXIV

E.E.Green del.

P.W.M.T. impr.

C.E.S. lith.

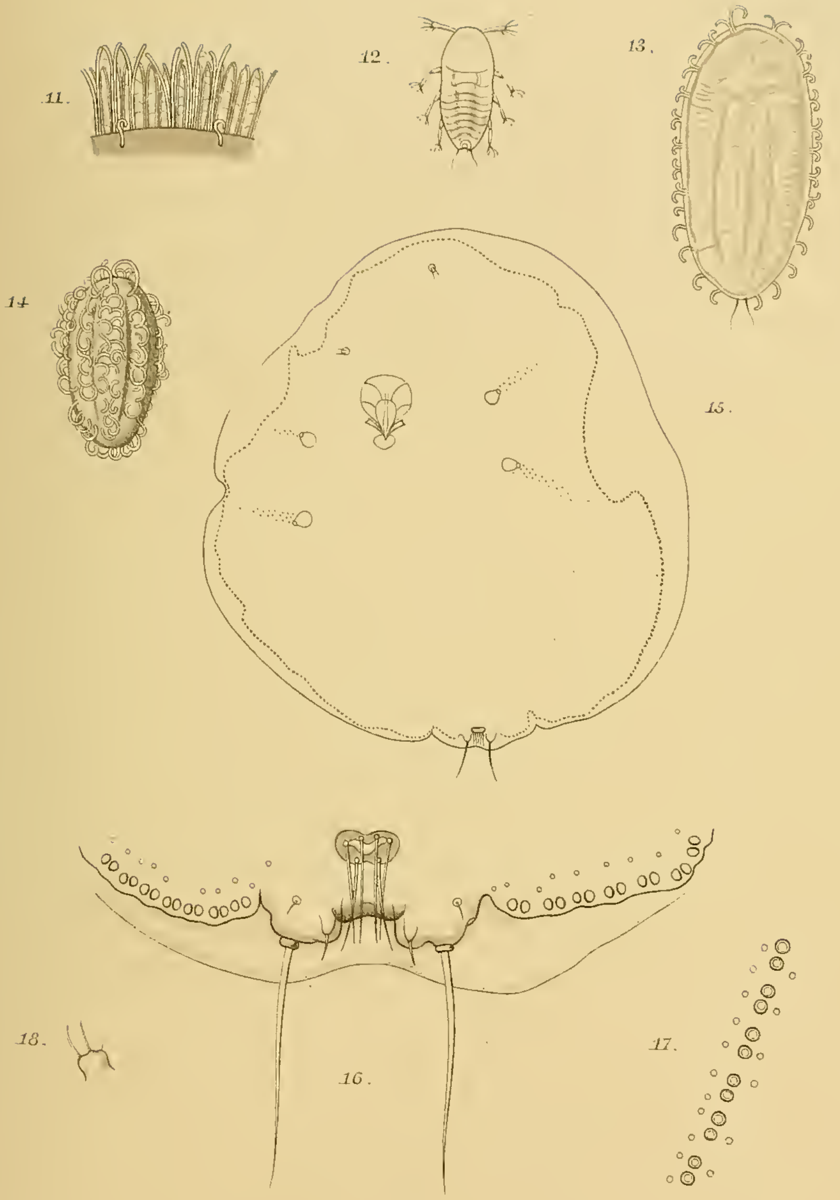
ASTEROLECANIUM CORONATUM.

EXPLANATION OF PLATE CXXV.

ASTEROLECANIUM BAMBUSÆ.

Fig. 1. Section of bamboo stem, with insects, nat. size.
2. Adult female, before deposition of eggs, ventral view, × 20.
3. „ older example, dorsal view, × 20.
4. „ after deposition of eggs, dorsal view, × 20.
5. „ „ „ ventral view, × 20.
6. „ „ „ side view, × 20.
7. Early adult female, dorsal view, × 20.
8. „ „ side view, × 20.
9. Fringe of adult female, × 150.
10. Early adult female, shortly after ecdysis, × 15.
11. Fringe of early adult female, × 250.
12. Newly hatched larva, × 75.
13. Older larva, dorsal view, × 35.
14. ? male puparium, dorsal view, × 25.
15. Adult female, after maceration, ventral view, × 70.
16. Abdominal extremity of adult female, × 450.
17. Marginal glands of adult female, × 450.
18. Antenna of adult female, × 450.

ASTEROLECANIUM BAMBUSÆ.



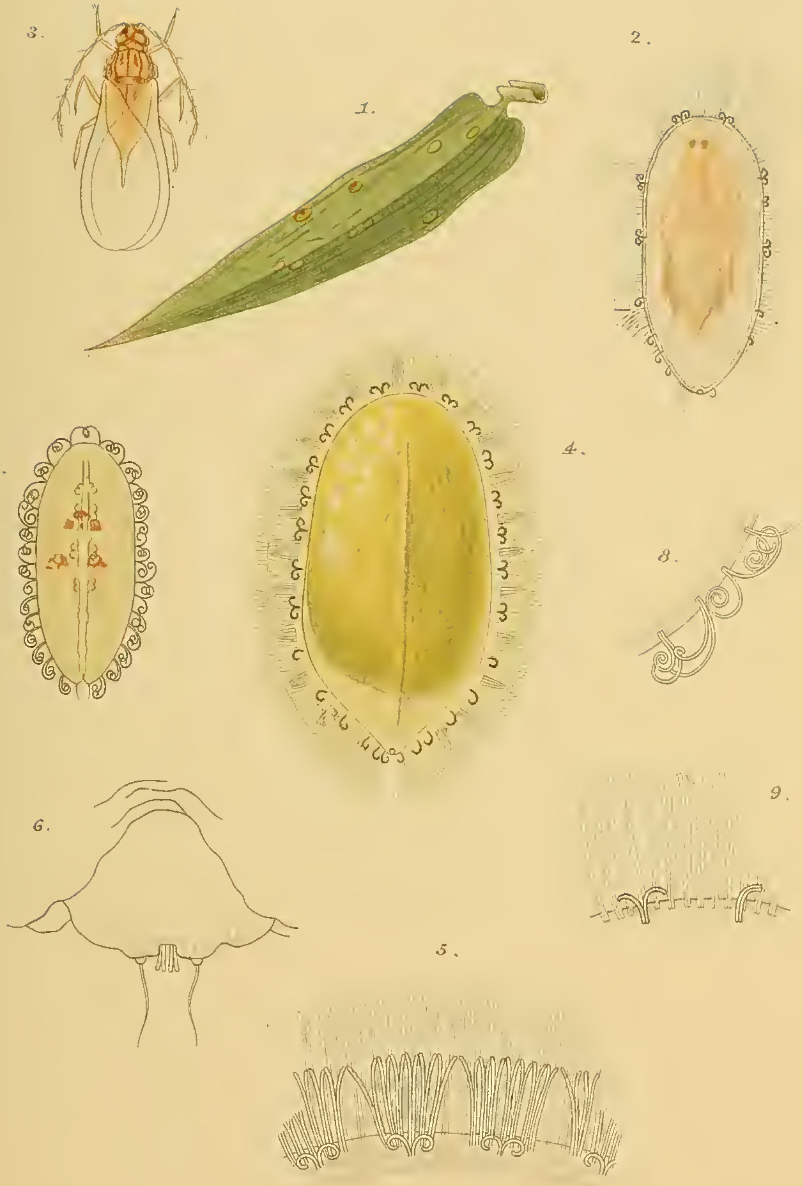
E.E.Green del. P.W.M.T. impr. C.E.S. lith.

ASTEROLECANIUM BAMBUSÆ.

EXPLANATION OF PLATE CXXVI.

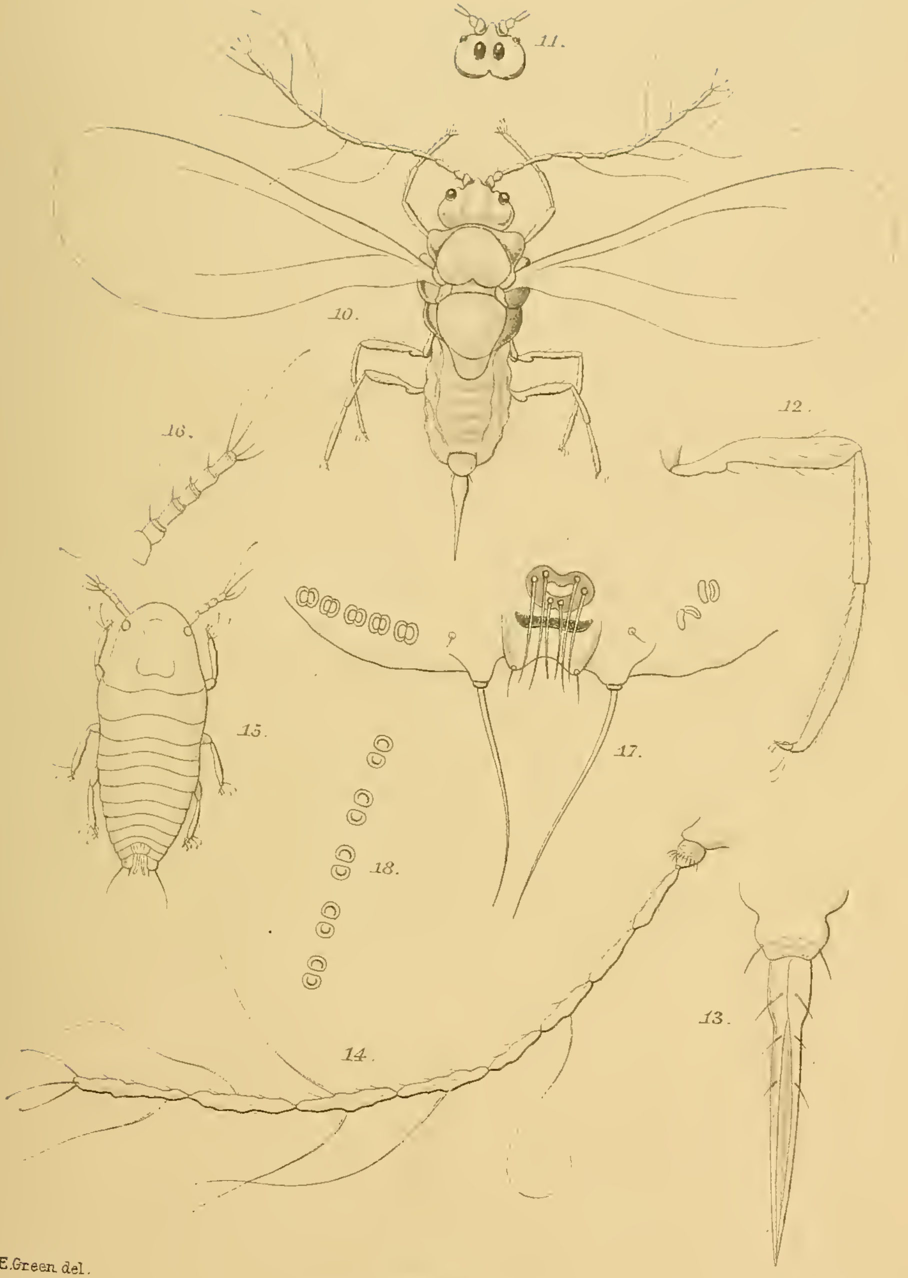
Asterolecanium delicatum.

Fig. 1. Bamboo leaf, with insects *in situ*, nat. size.
2. Male puparium, dorsal view, × 20.
3. Adult male, × 20.
4. Adult female in test, dorsal view, × 25.
5. Fringe of female test, × 135.
6. Abdominal extremity of adult female, after oviposition, × 120.
7. Half-grown larva, dorsal view, × 50.
8. Larval fringe, × 100.
9. Fringe of male puparium, × 135.
10. Adult male, dorsal view, × 50.
11. Head of adult male, from below, × 50.
12. Leg of adult male, × 135.
13. Genital sheath of male, ventral view, × 135.
14. Antenna of male, × 135.
15. Newly hatched larva, × 20.
16. Antenna of larva, × 50.
17. Abdominal extremity of adult female, × 450.
18. Marginal spinnerets of female, from thorax, × 420.



E.E.Green del. P.W.M.T impr. F.S lith.

ASTEROLECANIUM DELICATUM.



E.E.Green del. P.W.M.T impr. C.E.S. lith.

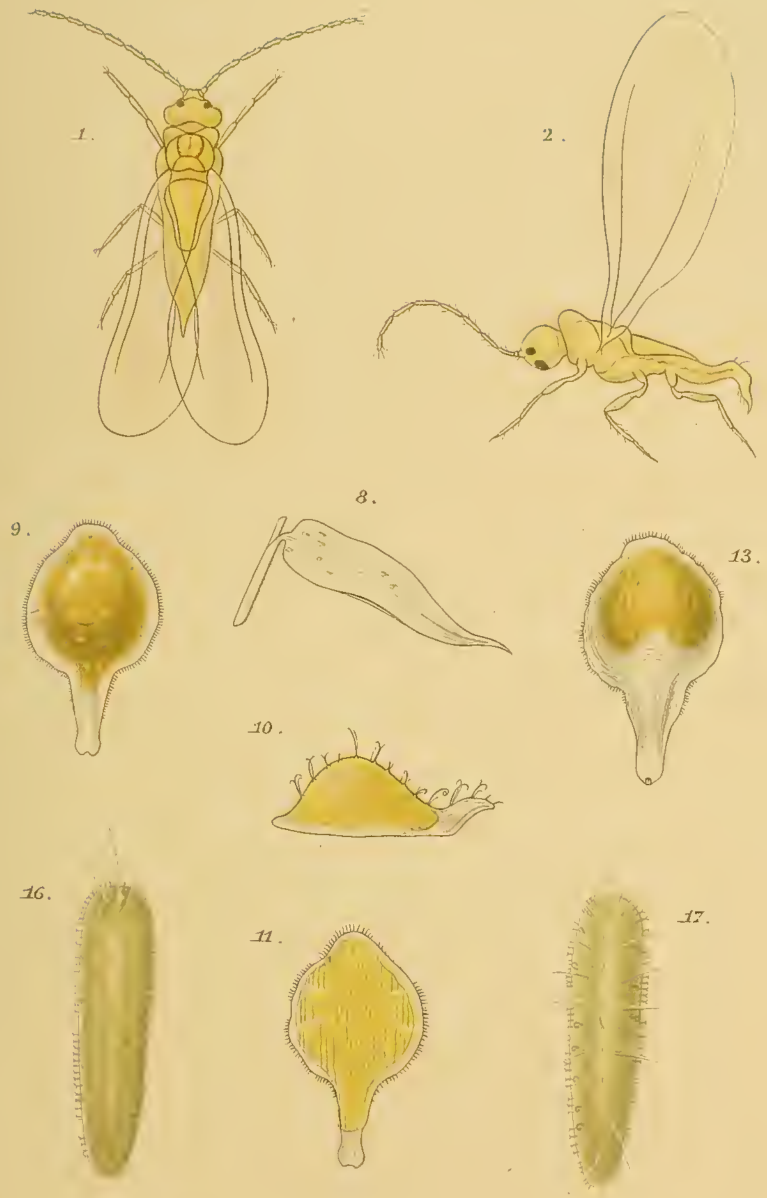
ASTEROLECANIUM DELICATUM.

EXPLANATION OF PLATE CXXVII.

Asterolecanium solenophoroides.

Fig. 1. Adult male, dorsal view, × 60.
2. „ „ lateral view, × 60.
3. Antenna of male, × 175.
4. Terminal joint of antenna, × 350.
5. Head of male, under side, × 60.
6. Leg of male, × 300.
7. Genital sheath and penis, × 250.
8. Leaf of *Arundinaria*, with insects *in situ*, nat. size.
9. Adult female, dorsal view, before oviposition, × 40.
10. „ „ lateral view, × 40.
11. „ „ ventral view, × 40.
12. „ „ front view, × 40.
13. „ „ dorsal view, after oviposition, × 40.
14. Fringe of adult female, × 300.
15. Young larva, ventral view, × 75.
16. Male puparium, dorsal view, × 40.
17. „ „ with dorsal filaments intact, × 40.
18. Adult female insect, before gestation, × 70.
19. Abdominal extremity of female, × 450.
20. Marginal glands of female, × 450.

Pl. CXXVII

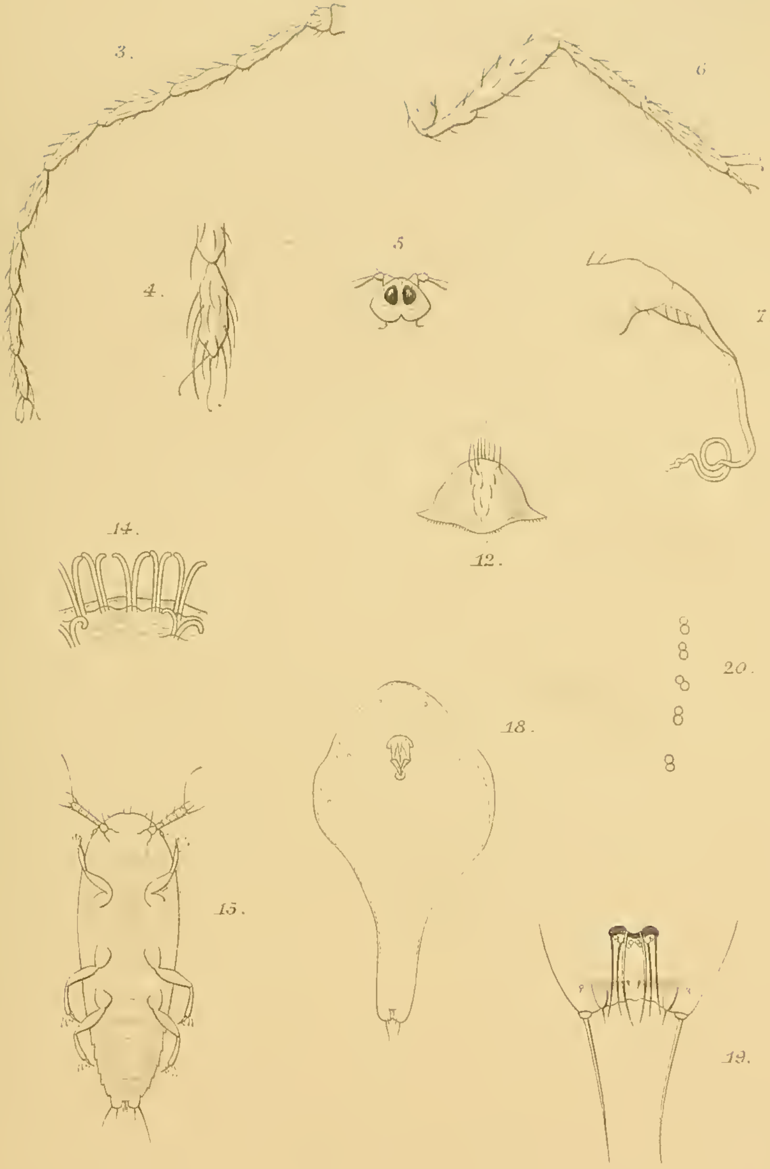


E.E.Green del.

P.W.M.T.impr.

C.E.S. lith.

ASTEROLECANIUM SOLENOPHOROIDES.



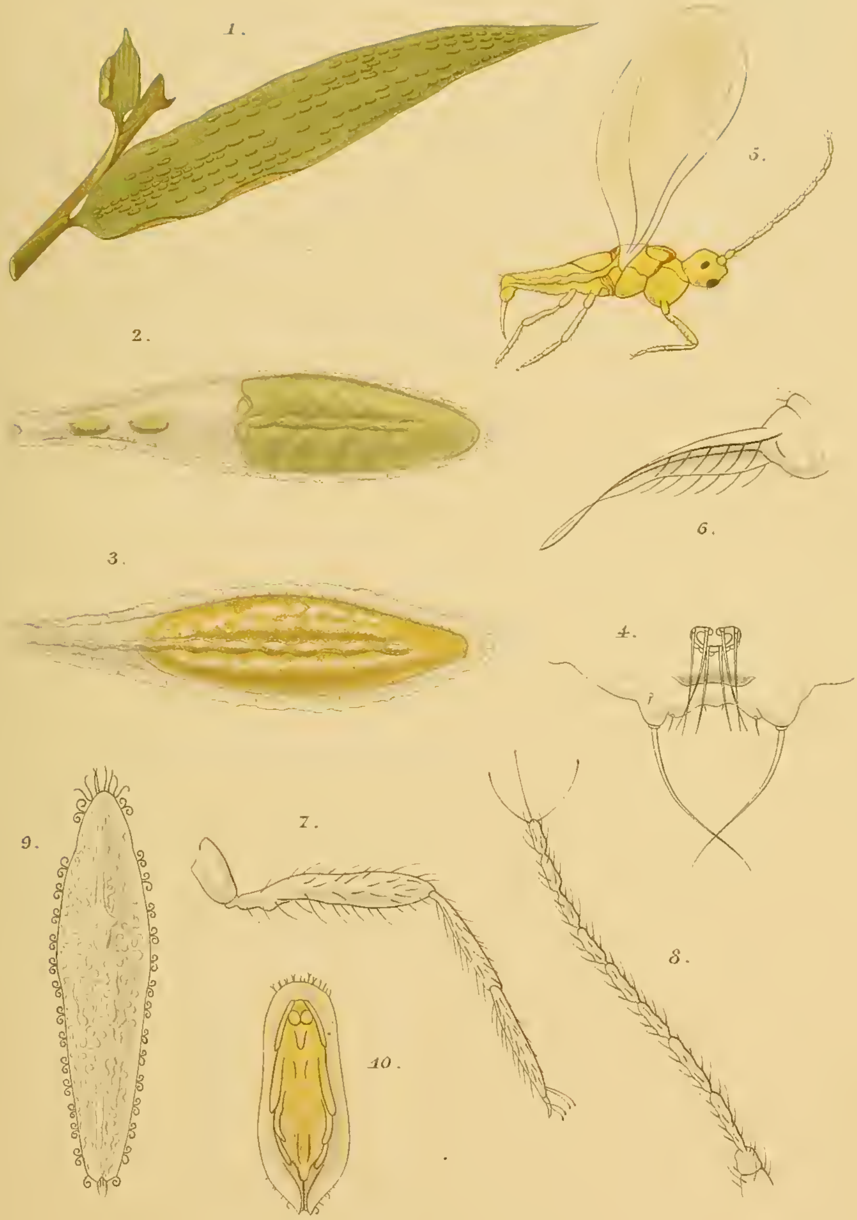
E.E.Green del. F.W.M.T impr. C.E.S. lith.

ASTEROLECANIUM SOLENOPHOROIDES.

EXPLANATION OF PLATE CXXVIII.

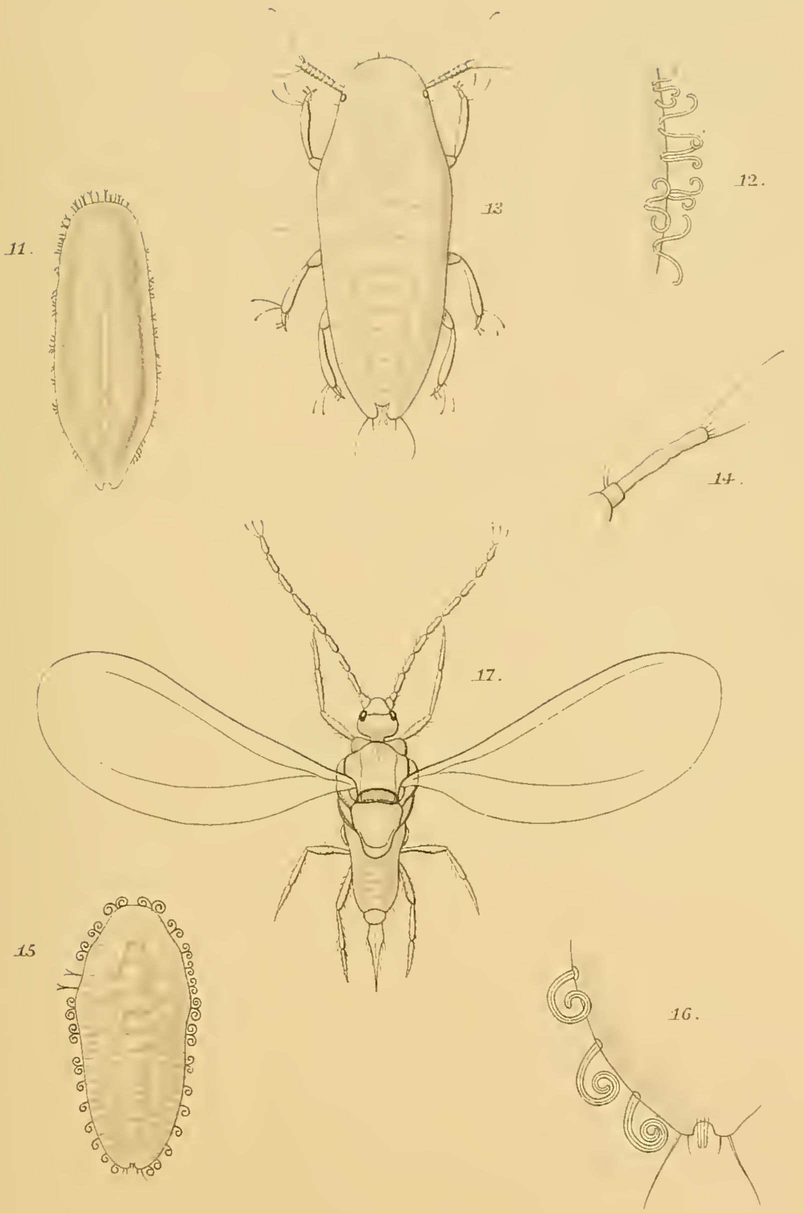
Asterolecanium lineare.

Fig. 1. Leaf of *Arundinaria*, with insects, nat. size.
2. Test of adult female, after oviposition, × 50.
3. " " before oviposition, × 50.
4. Abdominal extremity of adult female, × 450.
5. Adult male, side view, × 65.
6. Genital sheath of male, × 250.
7. Leg of male, × 250.
8. Antenna of male, × 250.
9. Female nymph, dorsal view, × 50.
10. Puparium of male, ventral view, × 35.
11. " " dorsal view, × 35.
12. Fringe of male puparium, × 250.
13. Young larva, dorsal view, × 250.
14. Antenna of young larva, × 500.
15. Older larva, dorsal view, × 100.
16. Larval fringe, × 450.
17. Adult male, dorsal view, × 65.



F.E.Green del. E.W.M.T impr. C.F.S lith.

ASTEROLECANIUM LINEARE.



E. E. Green del. P. W. M. T. impr. C. F. S. lith.

ASTEROLECANIUM LINEARE.

EXPLANATION OF PLATE CXXIX.

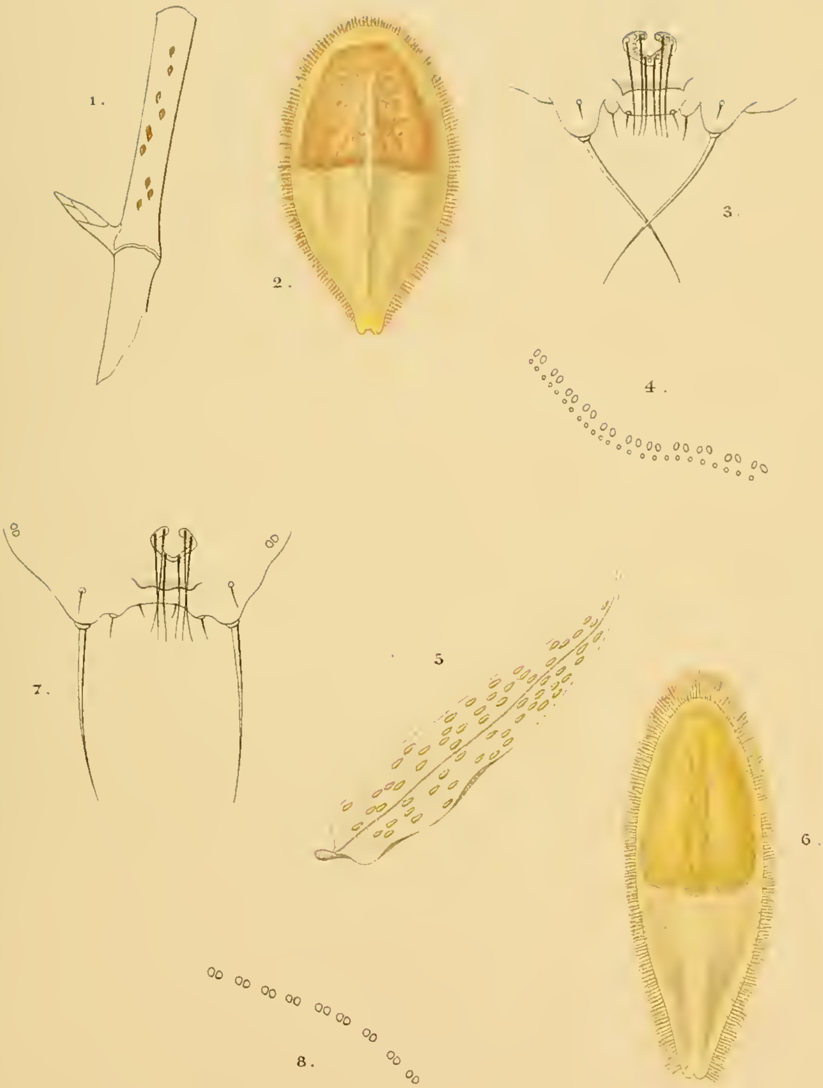
Asterolecanium miliaris.

Fig. 1. Female insects on branches of bamboo, nat. size.
2. Female test, dorsal view, × 40.
3. Posterior extremity of adult female, × 450.
4. Marginal glands of adult female, × 450.

Asterolecanium miliaris, *v.* longum.

Fig. 5. Insects on leaf of bamboo, nat. size.
6. Female test, dorsal view, × 40.
7. Posterior extremity of adult female, × 450.
8. Marginal glands of adult female, × 450.

Pl. CXXIX



E.E.Green del. P.W.M.T.impr. G.F.S lith.

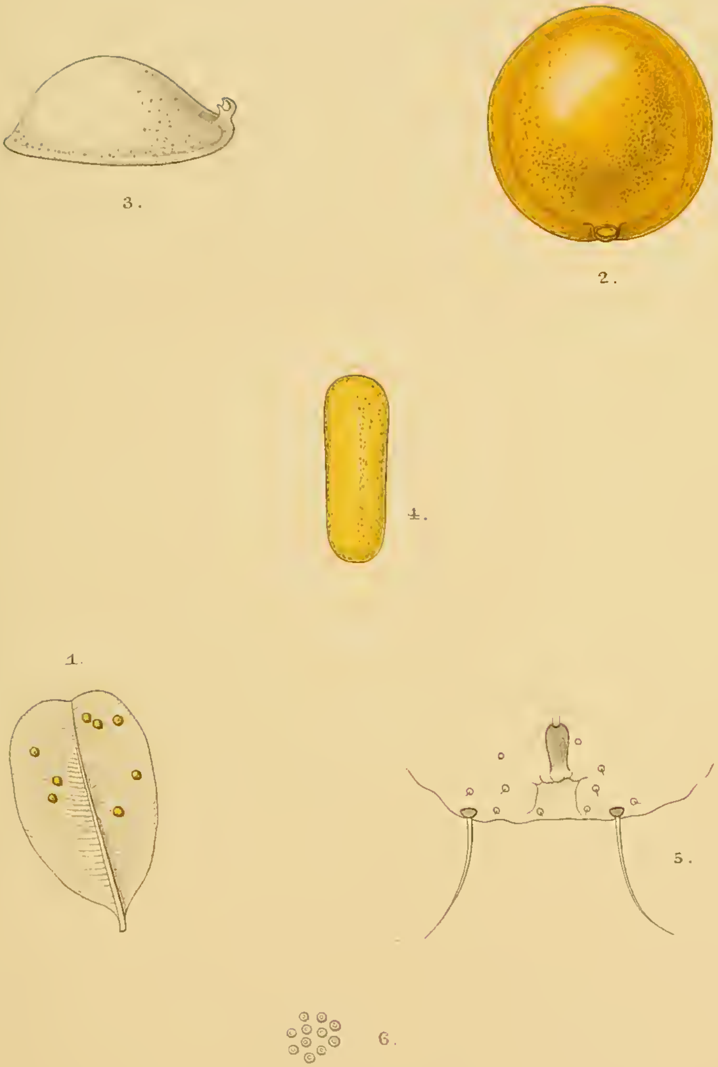
ASTEROLECANIUM MILIARIS 1—4.
„ MILIARIS var. LONGUM 5—8.

EXPLANATION OF PLATE CXXX.

POLLINIA CEYLONICA.

Fig. 1. Female insect on leaf, nat. size.
2. Test of adult female, dorsal view, × 25.
3. Test of female, lateral view, × 25.
4. Male puparium, dorsal view, × 25.
5. Abdominal extremity of female, optical section, × 450.
6. One of the dorsal groups of glands, × 450.

Pl. CXXX



E.E.Green del.   P.W.M.T. impr.   C.F.S. lith.

POLLINIA CEYLONICA.

EXPLANATION OF PLATE CXXXI.

AMORPHOCOCCUS MESUÆ.

Fig. 1. Branch of *Mesua ferrea*, with galls, nat. size.
2. Section of gall, with adult female, *in situ*, × 8.
3. ,, with adult enveloped in nymphal skin, × 8.
4. Adult female, ventral view, × 20.
5. Anal segment of female, × 450.
6. Full-grown larva, dorsal view, × 50.
7. Embryonic larva, optical section, × 250.

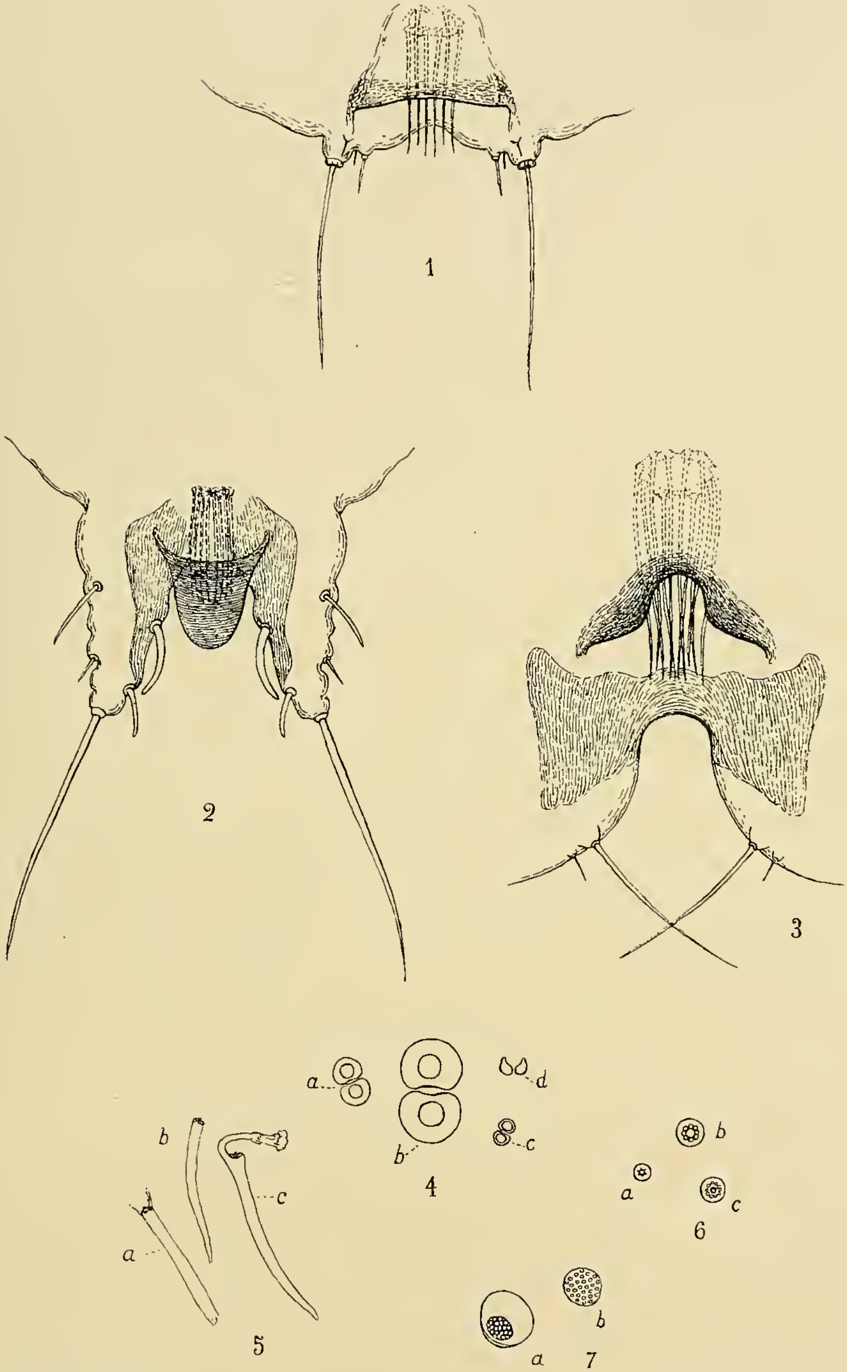
E.E.Green del. P.W.M.T.impr. C.E.S. lith.

AMORPHOCOCCUS MESUÆ.

EXPLANATION OF PLATE CXXXII.

ASTEROLECANIINÆ.

Fig. 1. Anal segment of *Asterolecanium.*
2. „ „ *Cerococcus.*
3. „ „ *Lecaniodiaspis.*
4. Paired dermal glands ;
   (*a*) from *Asterolecanium aureum.*
   (*b*) from *Cerococcus albospicatus.*
   (*c*) from *Lecaniodiaspis azadirachtæ.*
   (*e*) from *Anomalococcus cremastogastri.*
5. Tubular dermal glands ;
   (*a*, *b*) from *Asterolecanium aureum.*
   (*c*) from *Lecaniodiaspis malaboda.*
6. Ceriferous glands ;
   (*a*) from *Asterolecanium rubrocomatum.*
   (*b*) from *Cerococcus albospicatus.*
   (*c*) from *Lecaniodiaspis malaboda.*
7. Cribriform plates ;
   (*a*) from *Cerococcus albospicatus.*
   (*b*) from *Lecaniodiaspis azadirachtæ.*



E. E. Green, del.

ASTEROLECANIINÆ.

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